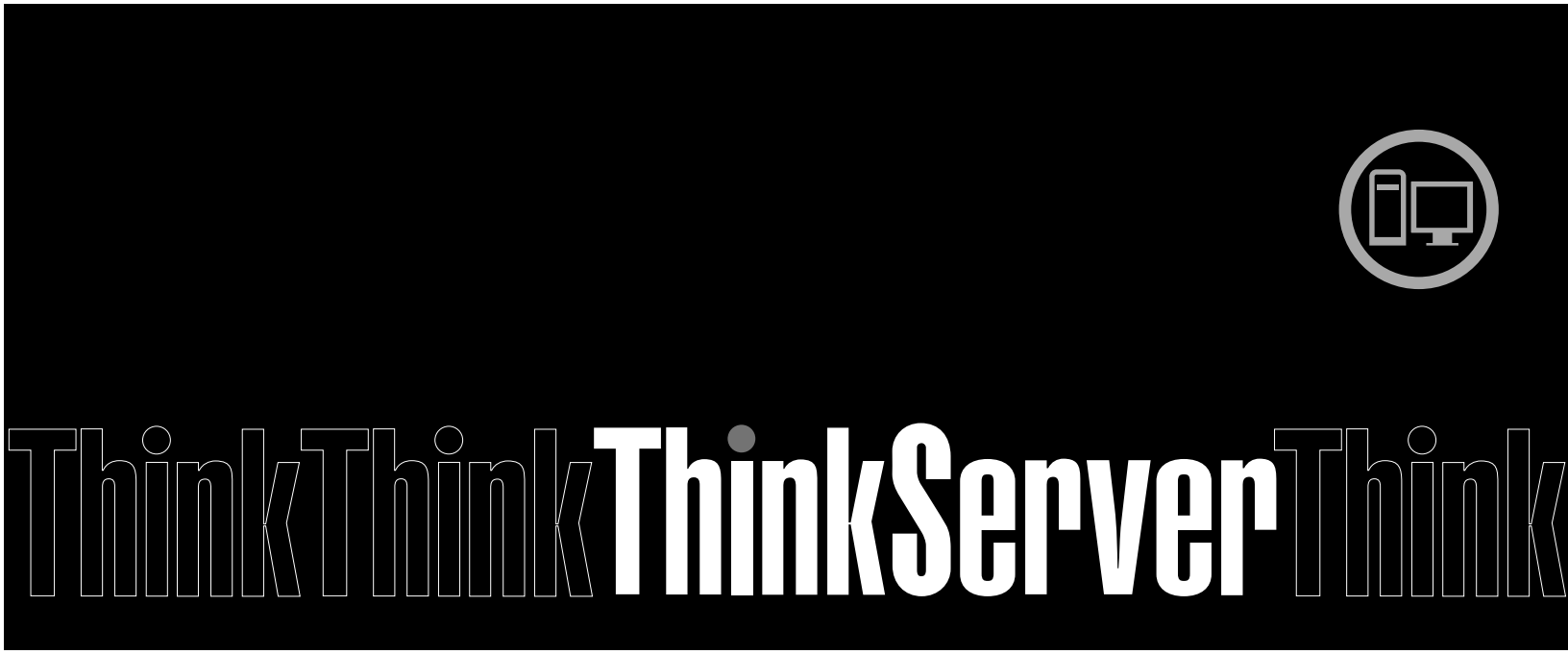
lenovo

ThinkServer User Guide



Machine Types: 0387, 0388, 0389, 0390, 0391, 0392, 0393, and 0441

Note:

Before using the information and the product it supports, be sure to read and understand the following:

- The *Read Me First* that comes with your product
- “Safety information” on page iii
- Appendix A “Notices” on page 179

First Edition (June 2011)

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Safety information

Note: Before using the product, be sure to read and understand the multilingual safety instructions on the documentation DVD that comes with the product.

قبل استخدام المنتج، تأكد من قراءة إرشادات الأمان متعددة اللغات وفهمها، وتوجد هذه الإرشادات في قرص DVD الوثائقي الذي يأتي مع المنتج.

Antes de usar o produto, leia e entenda as instruções de segurança multilíngues no DVD de documentação que o acompanha.

Преди да използвате този продукт, задължително прочетете и вникнете в многоезичните инструкции за безопасност в DVD диска с документация, който се предоставя с продукта.

Prije upotrebe ovog proizvoda obavezno pročitajte višejezične sigurnosne upute koje se nalaze na DVD-u s dokumentacijom koji dobivate uz proizvod.

Před použitím produktu je třeba si přečíst a porozumět bezpečnostním pokynům uvedeným na disku DVD s dokumentací, který je dodáván s produktem.

Før du bruger produktet, skal du sørge for at læse og forstå de sikkerhedsforskrifter, der findes på flere sprog, på den dokumentations-dvd, der følger med produktet.

Lue tuotteen mukana toimitetulla DVD-tietolevyllä olevat monikieliset turvaohjeet ennen tämän tuotteen käyttöä.

Avant d'utiliser le produit, veillez à bien lire et comprendre les instructions de sécurité multilingues figurant sur le DVD de documentation fourni avec le produit.

Πριν χρησιμοποιήσετε το προϊόν, βεβαιωθείτε ότι έχετε διαβάσει και κατανοήσει τις οδηγίες ασφάλειας, οι οποίες είναι διαθέσιμες σε διάφορες γλώσσες στο DVD τεκμηρίωσης που συνοδεύει το προϊόν.

Vor Verwendung des Produkts sollten Sie unbedingt die mehrsprachigen Sicherheitsanweisungen auf der Dokumentations-DVD lesen, die im Lieferumfang des Produkts enthalten ist.

לפני השימוש במוצר, הקפידו לקרוא ולהבין את הוראות הבטיחות, המופיעות בשפות שונות ב-DVD התיעוד המצורף למוצר.

A termék használata előtt mindenképpen olvassa el és értelmezze a termékhez kapott dokumentációs DVD lemezen található, több nyelven elolvasható biztonsági előírásokat.

Prima di utilizzare il prodotto, accertarsi di leggere e comprendere le informazioni sulla sicurezza multilingue disponibili sul DVD di documentazione fornito con il prodotto.

製品をご使用になる前に、製品に付属の Documentation DVD に収録されているマルチリンガルの「安全に正しくご使用いただくために」を読んで理解してください。

제품을 사용하기 전에 제품과 함께 제공되는 문서 DVD의 다국어 안전 지침을 주의 깊게 읽어보십시오.

Voordat u het product gebruikt, moet u ervoor zorgen dat u de meertalige veiligheidsinstructies op de documentatie-dvd van het product hebt gelezen en begrijpt.

Przed skorzystaniem z produktu należy zapoznać się z wielojęzycznymi instrukcjami bezpieczeństwa znajdującymi się na płycie DVD z dokumentacją dostarczoną wraz z produktem.

Antes de utilizar o produto, leia atentamente as instruções de segurança multilingues que constam no DVD de documentação fornecido com o produto.

Înainte de a utiliza produsul, asigurați-vă că ați citit şi înțeles instrucțiunile de siguranță în mai multe limbi de pe DVD-ul cu documentație care însoțeşte produsul.

Før du bruker produktet, må du lese og forstå den flerspråklige sikkerhetsinformasjonen på DVDen med dokumentasjon som følger med produktet.

Прежде чем использовать этот продукт, внимательно ознакомьтесь с инструкциями по технике безопасности на разных языках, которые можно найти на DVD-диске с документацией в комплекте с продуктом.

在使用本产品之前，请务必先阅读和了解产品附带的文档 DVD 中的多语言安全说明。

Pre nego to upotrebite proizvod obavezno paljivo proitajte i prouite viejeziko uputstvo za bezbednost na dokumentacionom DVD-u koji ste dobili uz proizvod.

Pred pouvanm produktu si pretajte viacjazyn bezpenostn pokyny na disku DVD s dokumentciou dodanom s produktom.

Preden začnete uporabljati izdelek, je pomembno, da preberete in razumete večjezična varnostna navodila na DVD-ju z dokumentacijo, ki ste ga prejeli skupaj z izdelkom.

Antes de utilizar el producto, asegúrese de leer y comprender las instrucciones de seguridad multilingües del DVD de documentación que se proporciona con el producto.

Var noga med att läsa säkerhetsinstruktionerna på dokumentations-DVD-skivan som följer med produkten innan du börjar använda produkten.

使用本產品之前，請務必閱讀並瞭解產品隨附的文件 DVD 上的多國語言版本安全資訊。

Bu ürünü kullanmadan önce, ürünle birlikte gönderilen belge DVD'si üzerindeki çok dil içeren güvenlik yönergelerini okuyup anladýðýnýzdan emin olun.

Перед використанням цього продукту уважно ознайомтеся з інструкціями з техніки безпеки на різних мовах, що можна знайти на DVD-диску з документацією в комплекті з продуктом.

Important: Each caution and danger statement in this topic is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document. For example, if a danger statement is labeled “Statement 1,” translations for this danger statement are in the *Safety Information* document under “Statement 1.”

Be sure to read and understand all caution and danger statements in this document before you perform the procedures. Read and understand any additional safety information that comes with the server or optional device before you install, remove, or replace the device.

Statement 1

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To connect:	**To disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn devices ON.	

Statement 2

 **DANGER**

Danger of explosion if battery is incorrectly replaced.

When replacing the lithium coin cell battery, use only the same or an equivalent type that is recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Statement 3

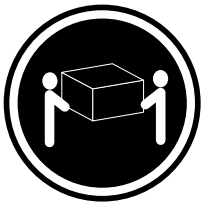
CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

 **DANGER**

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following. **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

Statement 4

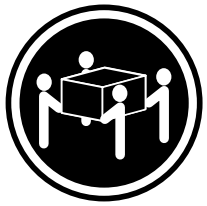


≥ 18 kg (39.7 lb)

< 32 kg (70.5 lb)

≥ 32 kg (70.5 lb)

< 55 kg (121.2 lb)



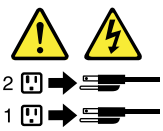
≥ 55 kg (121.2 lb)

< 100 kg (220.5 lb)

CAUTION:
Use safe practices when lifting.

Statement 5

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 6

CAUTION:
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

Statement 7

CAUTION:
If the device has doors, be sure to remove or secure the doors before moving or lifting the device to avoid personal injury. The doors will not support the weight of the device.

Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 9

CAUTION:
To avoid personal injury, disconnect the hot-swap fan cables before removing the fan from the device.

Statement 10

CAUTION:
The following label indicates sharp edges, corners, or joints nearby.

Statement 11

CAUTION:
The following label indicates a hot surface nearby.

Statement 12

DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.

Statement 13

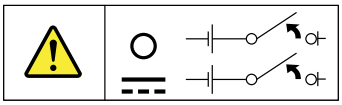
CAUTION:
Make sure that the rack is secured properly to avoid tipping when the server unit is extended.

Statement 14

CAUTION:
Some accessory or option board outputs exceed Class 2 or limited power source limits and must be installed with appropriate interconnecting cabling in accordance with the national electric code.

Statement 15

CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.



Statement 16

CAUTION:
To reduce the risk of electric shock or energy hazards:

- **This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and the latest edition of IEC 60950, The Standard for Safety of Information Technology Equipment.**
- **Connect the equipment to a reliably grounded safety extra low voltage (SELV) source. An SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).**
- **The branch circuit overcurrent protection must be rated in accordance with local building codes.**
- **Use 16 American Wire Gauge (AWG) or 1.3 mm^2 copper conductor only, not exceeding 3 meters in length.**
- **Torque the wiring-terminal screws to 12 inch-pounds (1.4 newton-meters).**
- **Incorporate a readily available approved and rated disconnect device in the field wiring.**

Statement 17

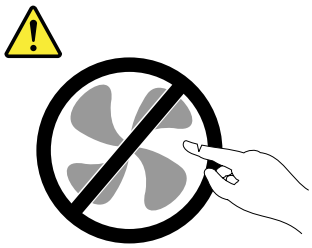
CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments.

Statement 18

CAUTION:
Do not place any object on top of rack-mounted devices.

Statement 19

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



Statement 20

CAUTION:
The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the Lenovo-approved part. Recycle or discard the battery as instructed by local regulations.

Chapter 1. General information

This chapter provides some general information about your product.

This chapter contains the following items:

- “Introduction” on page 1
- “Server documentation” on page 2

Introduction

This user guide for your Lenovo® ThinkServer® product contains information about the server features, specifications, component locations, configuration instructions, hardware replacement procedures, and basic troubleshooting and diagnostics.

Your server comes with a documentation DVD that contains various server documents to help you use and maintain the server. Meanwhile, your server comes with a *ThinkServer EasyStartup* DVD that provides a convenient solution for configuring the server and installing an operating system.

The Lenovo Limited Warranty (LLW) contains the warranty terms that apply to the product you purchased from Lenovo. Read the LLW on the documentation DVD that comes with your server. A printable generic version of the latest LLW is also available in more than 30 languages at http://www.lenovo.com/warranty/llw_01. If you cannot obtain the LLW through the documentation DVD or Lenovo Web site, contact your local Lenovo office or reseller to obtain a printed version of the LLW, free of charge.

For warranty service, consult the worldwide Lenovo Support telephone list. Telephone numbers are subject to change without notice. The most up-to-date telephone list for Lenovo Support is always available on the Web site at http://www.lenovo.com/support/phone. If the telephone number for your country or region is not listed, contact your Lenovo reseller or Lenovo marketing representative.

To obtain the most up-to-date information about the server, go to:
http://www.lenovo.com/thinkserver

Lenovo maintains pages on the World Wide Web where you can get the latest technical information and download documentation or device drivers and updates. To access the Lenovo Support Web site, go to:
http://www.lenovo.com/support

Record information about your server in the following table. You will need the information if you ever need to have your server serviced.

For where to find the product information label on the chassis, see “Machine type, model, and serial number label” on page 13.

Product name	_____
Machine type and model (MT-M)	_____
Serial number (S/N)	_____
Date of purchase	_____

You can register your server by following the instructions at:
http://www.lenovo.com/register

You will receive the following benefits after registering your server:

- Faster service when you call for help
- Automatic notification of free software and special promotional offers

Server documentation

This topic provides general descriptions of the various documentation for your server and instructions on how to obtain all the documentation.

Printed documents

The following documents are printed out and contained in your server package.

- *Read Me First*

  This is a multilingual document you should read first. This document guides you to read the complete warranty, support, and safety information on the documentation DVD that comes with your server before using the product. This document also provides information about how to find the most up-to-date information on the Lenovo Support Web site.

- *Important Notices*

  This document includes safety and legal notices that you should read and understand before using the server.

Documentation DVD

The documentation DVD, which comes with your server, contains various documents for your server in Portable Document Format (PDF). To view the documentation, you need to have the Adobe Reader program installed. You can download the desired language version of the latest Adobe Reader program from the Adobe Web site at:
http://www.adobe.com

Note: Lenovo maintains pages on the World Wide Web where you can get the latest technical information and download documentation or device drivers and updates. Some information in the documents on the

documentation DVD might change without notice after the first release of the DVD. You can always obtain all the most up-to-date documentation for your server from the Lenovo Web site at:
http://www.lenovo.com/ThinkServerUserGuides

The following documents are on the documentation DVD that comes with your server:

- *Safety Information*

  This is a multilingual document that includes all the safety statements for your product in more than 30 languages. Be sure to read and understand all the safety statements before using the product.

- *Warranty and Support Information*

  This document includes the Lenovo warranty statement, Customer Replaceable Units (CRUs) information, and information about how to contact Lenovo Support.

- *User Guide*

  This document provides detailed information to help you get familiar with your server and help you use, configure, and maintain your server.

- *Remote Management Module User Guide*

  This document provides information to help you use the integrated Keyboard, Video, and Mouse (iKVM) function for server remote management. This document is in English only.

  Note: A ThinkServer iKVM Remote Management Module (hereinafter referred to as the iKVM key) is required and this option should be installed on the iKVM key connector on the system board to enable the iKVM function.

- *MegaRAID SAS Software User Guide*

  This document provides information about Redundant Array of Independent Disks (RAID) and how to use the utility programs to configure, monitor, and maintain your server RAID and related devices. This document is in English only.

  Note: Refer to this document for hardware RAID information if you have a required RAID card installed in the server. See “Installing or removing the RAID card” on page 98. For information about the onboard SATA software RAID, see “Configuring the onboard SATA software RAID” on page 75.

Document for trained service personnel only

The following document is intended for trained service personnel of Lenovo and is only available in English on the Lenovo Web site at:
http://www.lenovo.com/ThinkServerUserGuides

Hardware Maintenance Manual

This document provides diagnostic information, parts listing, and replacement procedures for all field replaceable units (FRUs, parts replaced by trained service personnel) as well as all CRUs.

Chapter 2. Server setup road map

This chapter provides a general road map to guide you through setting up your server.

The server setup procedure varies depending on the configuration of the server when it was delivered. In some cases, the server is fully configured and you just need to connect the server to the network and an ac power source, and then you can turn on the server. In other cases, the server needs to have hardware features installed, requires hardware and firmware configuration, and requires an operating system to be installed.

The general procedure for setting up your server is:

1. Unpack the server package. See “Server package” on page 7.
2. Install any required hardware or server option. See the related topic in Chapter 6 “Installing, removing, or replacing hardware” on page 83.
3. Connect the Ethernet cable and power cord(s) to the server. See “Rear view of the server” on page 19 to locate the connectors.
4. Turn on the server to verify operation. See “Turning on the server” on page 53.
5. Review the Unified Extensible Firmware Interface (UEFI) settings and customize as needed. See “Using the Setup Utility program” on page 55.
6. Configure RAID and install the operating system and basic drivers. See “Using the ThinkServer EasyStartup program” on page 69 and “Configuring RAID” on page 71.
7. Install any additional drivers needed for added features. Refer to the instructions that come with the hardware option.
8. Configure Ethernet settings in the operating system by referring to the operating system help. This step is not required if the operating system was installed using the ThinkServer EasyStartup program.
9. Check for firmware and driver updates. See “Updating the firmware” on page 81.
10. Install other applications. Refer to the documentation that comes with the applications that you want to install.

Chapter 3. Product overview

This chapter provides information about the server package, features, specifications, software programs, and component locations.

This chapter contains the following items:

- “Server package” on page 7
- “Features” on page 7
- “Specifications” on page 12
- “Software” on page 12
- “Locations” on page 13

Server package

The server package includes the server, power cord(s), printed documentation, documentation DVD, and software media.

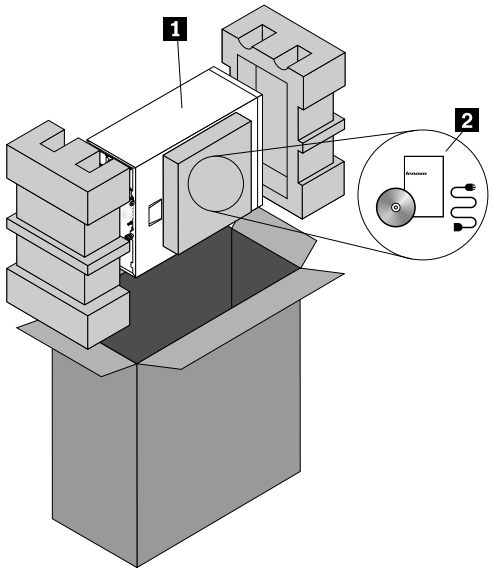


Figure 1. Server package

1 Server

2 Material box, including power cord(s), printed documentation, documentation DVD, and software media

Features

This topic provides general information about the server features for a variety of models. Depending on your specific model, some features might vary or not be available. For information about your specific model, use the Setup Utility program. See “Viewing information in the Setup Utility program” on page 55.

Microprocessor

Your server comes with one of the following microprocessors (internal cache size varies by model):

- Intel® Xeon® quad-core microprocessor
- Intel Xeon dual-core microprocessor
- Intel Core™ i3 microprocessor

For a list of the ThinkServer microprocessor options, go to http://www.lenovo.com/thinkserver. Click the **Products** tab and then click **Options → ThinkServer Processors** to view the information.

Memory

Your server supports up to four double data rate 3 unbuffered dual inline memory modules (DDR3 UDIMMs) with Error Checking and Correcting (ECC) technology.

- Supports 2 GB and 4 GB 1333 MHz DDR3 UDIMMs
- Single-rank or dual-rank
- Minimum system memory: 2 GB (only one 2 GB memory module installed in the DIMMA2 slot)
- Maximum system memory: 16 GB (one 4 GB memory module installed in each of the four memory slots)

For more information, see “System board components” on page 42 and “Memory module installation rules” on page 90.

Power supply

Your server comes with one of the following power supply configurations:

- One screw-secured, non-hot-swap 400-watt power supply (80 Plus Bronze Compliant and universal input)
- One or two hot-swap 450-watt redundant power supply modules (80 Plus Gold Compliant and universal input)

Fans

You server comes with the following fans to provide proper system cooling and airflow:

- One heat sink and fan assembly
- One or two front system fans depending on the model
- One rear system fan

Internal drives

Internal drives are devices that your server uses to read and store data. The internal drives supported by your server vary by model.

- Hard disk drive
  - Five to eight 3.5-inch hot-swap Serial Advanced Technology Attachment (SATA) or Serial Attached SCSI (SAS) hard disk drives (SCSI is the acronym for Small Computer System Interface)
  - Up to eight 2.5-inch hot-swap SAS hard disk drives
  - Up to four 3.5-inch hot-swap SATA or SAS hard disk drives
  - Up to four 3.5-inch non-hot-swap SATA hard disk drives

  Note: For server models with more than four hard disk drives or models that use SAS hard disk drives, there must be a required RAID card installed. See “RAID card” on page 33.
- Optical drive
  - Up to two 5.25-inch SATA optical drives (DVD-ROM or DVD Burner / CD-RW Rambo 8)
  - The lower optical drive bay is installed with a 5.25-inch SATA optical drive (DVD-ROM or DVD Burner / CD-RW Rambo 8). The upper optical drive bay is for a Removable Disk Technology (RDX) Universal Serial Bus (USB) drive bundle.

For the location information about the internal drives or drive bays, see “Server components” on page 25. For information about the RDX USB drive bundle and instructions on how to install it, refer to the documentation that comes with the RDX USB drive bundle. In your server, the P6 power connector of the power supply is for the RDX USB drive bundle. You can purchase this option directly from Lenovo. The option name is Lenovo Removable Disk Technology (RDX) USB Drive Bundle. The RDX technology combines the characteristics of tape backup with disk storage to help you protect and archive data.

Expansion slots

The server has four expansion slots on the system board. For detailed information, see “System board components” on page 42.

Input/Output (I/O) features

- One Video Graphics Array (VGA) DB-15 connector on the rear panel
- Six USB 2.0 connectors (two on the front panel and four on the rear panel)
- Two RJ-45 Ethernet connectors on the rear panel
- Two serial connectors (one fully-functional serial connector on the rear panel and one internal serial connector on the system board for optional use)

For the location information about the connectors, refer to the related topic in “Locations” on page 13.

Video subsystem

An integrated graphics controller in the Baseboard Management Controller (BMC) chip on the system board to support a VGA DB-15 connector on the rear panel for connecting video devices

Ethernet connectivity

The server comes with an integrated Intel Gigabit Ethernet controller as well as an Ethernet physical layer (PHY) of the Open Systems Interconnection model (OSI model). They provide the server with the ability to support two Ethernet connectors on the rear panel with 10 Mbps, 100 Mbps, or 1000 Mbps network connectivity. For more information, see “Rear view of the server” on page 19.

Reliability, availability, and serviceability

Reliability, availability, and serviceability (hereinafter referred to as RAS) are three important server design features. The RAS features help you to ensure the integrity of the data stored on the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

Your server has the following RAS features:

- **Security features**
  - Server locks (see “Server locks” on page 22)
  - Administrator password and user password to help protect unauthorized access to the server (see “Using passwords” on page 65)
  - Trusted Platform Module (TPM) connector on the system board for a TPM module, which is a security chip, to help protect your server and strengthen server security

    Note: The TPM module is only available in some models.
  - Remote monitoring or control by an administrator to provide protection or help
  - Hot-swap redundant power supply modules to help you avoid significant interruption to the operation of the system when a power supply module fails (available in some models)
- **Basic system management features**
  - Ability to store the power-on self-test (POST) hardware test results
  - BIOS Setup Utility program

    The BIOS Setup Utility program helps you view the server information and configure the server in the pre-operating system environment. See “Using the Setup Utility program” on page 55.
  - BMC and Intelligent Platform Management Interface (IPMI) 2.0

    The system board platform management subsystem is based on the integrated BMC features. The BMC is a management chip that is integrated on the system board of your server. With the BMC chip, no matter what condition the server operating system is in and no matter if the server is on or off, as long as the server is connected to network and an ac power source, the interaction with the BMC controlled servers can be achieved through system network. The user can obtain the server hardware health information and system event log (SEL), and is able to conduct the operations including turning on or off the server, restarting the server, locking the power switch on the front panel, and so on. This part of the server management is independent of the operating system and is called out-of-band management.

    The system board platform management subsystem consists of the integrated BMC, communication buses, sensors, Basic Input Output System (BIOS), and server management firmware. It is responsible for error management and reporting, system power control, thermal monitoring, system fan control, and other management features. The BMC provides system management and monitoring features based on the IPMI 2.0 specification. IPMI helps lower the overall costs of server management. You can find more information about IPMI 2.0 from the Web site of Intel. The BMC also supports some non-IPMI features, such as the Dynamic Host Configuration Protocol (DHCP) and the Platform Environment Control Interface (PECI), to provide more system management functions.

    Refer to the *Remote Management Module User Guide* on the documentation DVD that comes with your server for more information.
  - Hot-swap feature

    Some models support hot-swap hard disk drives and or hot-swap redundant power supply modules. With the hot-swap feature, you can install, remove, or replace hard disk drives or a failing power supply module without turning off the server.

- Preboot Execution Environment (PXE)

  The Intel PXE technology enables you to boot your computers, load an operating system, or deploy executable images from a remote server by using a network interface. The operation can be done independently of local data storage devices (such as hard disk drives) or installed operating systems.

- Redundant Array of Independent Disks (RAID)

  Your server supports onboard SATA software RAID and advanced SATA/SAS hardware RAID configurations if you have a required RAID card installed. For detailed information, see “Configuring RAID” on page 71.

- Status light-emitting diodes (LEDs) and diagnostic LEDs

  For more information about the LEDs for your server, refer to the related topics in “Locations” on page 13.

- ThinkServer EasyStartup program and ThinkServer EasyUpdate Firmware Updater program

  For more information about the software programs, see “Software” on page 12.

- Wake on LAN

  When the Wake on LAN feature is enabled on a computer that is connected to a local area network (LAN), a network administrator can remotely turn on or wake up the computer from a management console using remote network management software. Besides, many other functions, such as data transfer and software updates, can be performed remotely without remote attendance and can be done after normal working hours and on weekends to save time and increase productivity.

- **Advanced system management features**

  The BMC firmware supports the following advanced system management features:

  Note: The advanced system management features are only available when the BMC detects the presence of an integrated keyboard, video, and mouse (iKVM) key. The iKVM key is a remote management module. You can purchase an iKVM key from Lenovo and install it on the iKVM key connector on the system board of your server to enable the iKVM function and activate the advanced system management features.

  - iKVM redirection

    The BMC firmware supports iKVM redirection over LAN. This feature is available remotely from the embedded Web server. The remote management module can digitize and compress the collected keyboard, video, and mouse signals from the host system and then send them to the remote console. Meanwhile, it is easily accessible by remote KVM and controllable through LAN or Internet. For detailed information, refer to the *Remote Management Module User Guide* on the documentation DVD that comes with your server.

  - Media redirection

    The embedded Web server provides a Java JNLP to enable the remote media redirection. This is used in conjunction with the remote KVM feature or as a standalone applet.

    The media redirection feature is intended to enable system administrators or users to mount a remote optical drive, floppy drive, or USB flash disk as a USB device to the server. Once mounted, the remote device functions as a local device to the server, enabling system administrators or users to boot the server and install software (including operating systems), copy files, update the BIOS from this device.

  - Web Services for Management (WS-MAN)

    The BMC firmware supports the WS-MAN specification.

  - Local Directory Authentication Protocol (LDAP)

    The BMC firmware supports the LDAP for user authentication.

    Note: The IPMI users, passwords, and sessions are not supported over LDAP.

– Embedded Web server

  The BMC provides an embedded Web server for out-of-band management. The user authentication is handled by IPMI user names and passwords. For more information, refer to the *Remote Management Module User Guide* on the documentation DVD that comes with your server.

Specifications

This topic lists the physical specifications for your server.

Dimensions

Width: 195 mm (7.68 inches)

Height: 430 mm (16.93 inches) without foot stands; 445 mm (17.52 inches) with foot stands

Depth: 595 mm (23.43 inches) including the front bezel

Weight

The product weight varies depending on different system configurations.

Range of product weight without package: 19 kg (41.89 lb) to 28 kg (61.73 lb)

Range of product package weight: 2.8 kg (6.17 lb) to 3.5 kg (7.72 lb)

Environment

- Air temperature:

  Operating: 10°C to 35°C (50°F to 95°F)

  Storage: -40°C to 70°C (-40°F to 158°F) in original shipping package
- Altitude: 0 to 3 048 m (0 to 10 000 ft)
- Humidity:

  Operating: 8% to 80% (non-condensing)

  Storage: 8% to 90% (non-condensing)

Electrical input

Universal input:

Minimum: 90 V ac

Maximum: 264 V ac

Input frequency range: 47 to 63 Hz

Software

This topic provides information about the software programs that you can use to help you set up, use, and maintain the server.

ThinkServer EasyStartup

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported Microsoft® Windows® and Linux operating systems and device drivers on your server. This program is provided with your server on a self-starting (bootable) *ThinkServer EasyStartup* DVD. The user guide for the program is also on the DVD and can be accessed directly from the program interface. For detailed information, see “Using the ThinkServer EasyStartup program” on page 69.

ThinkServer EasyUpdate Firmware Updater

The ThinkServer EasyUpdate Firmware Updater program (hereinafter referred to as Firmware Updater) enables you to maintain your server firmware up-to-date and helps you avoid unnecessary server outages. The Firmware Updater program is provided on the Lenovo Support Web site. For more information about downloading and using the Firmware Updater program, see “Updating the firmware” on page 81.

BIOS and BMC firmware update utility

The BIOS and BMC firmware keeps updating after the shipment of the server. Lenovo maintains pages on the Support Web site and provides the BIOS and BMC firmware update utility with instructions for download to help you update the BIOS and BMC firmware if needed. For more information, see “Updating or recovering the BIOS” on page 67 and or “Updating the firmware” on page 81.

RAID configuration utilities

Your server supports onboard SATA software RAID and advanced SATA/SAS hardware RAID configurations if you have a required RAID card installed. For detailed information, see “Configuring RAID” on page 71.

PC-Doctor for DOS

The PC-Doctor for DOS is a diagnostic tool that you can use to test and gather information about your system in order to ensure your system is working correctly and resolve any hardware issues. You can download the latest version of this diagnostic program from http://www.lenovo.com/support and create a self-starting DOS-based diagnostic utility that you can use to detect failing hardware components independently of the operating system. For more information, see “Using the diagnostic program” on page 168.

Locations

This topic provides information to help you locate your server components.

Machine type, model, and serial number label

This topic helps you locate the two labels that contain the machine type, model, and serial number information for your server. The two labels are the same. One is on the front bezel and the other is on the chassis.

The machine type, model, and serial number identify your server. When you contact Lenovo for help, the information helps support technicians to identify your server and provide faster service.

The following illustration is a sample of the machine type, model, and serial number labels on the server.

Note: Depending on the model type, your server might look slightly different from the illustration in this topic.

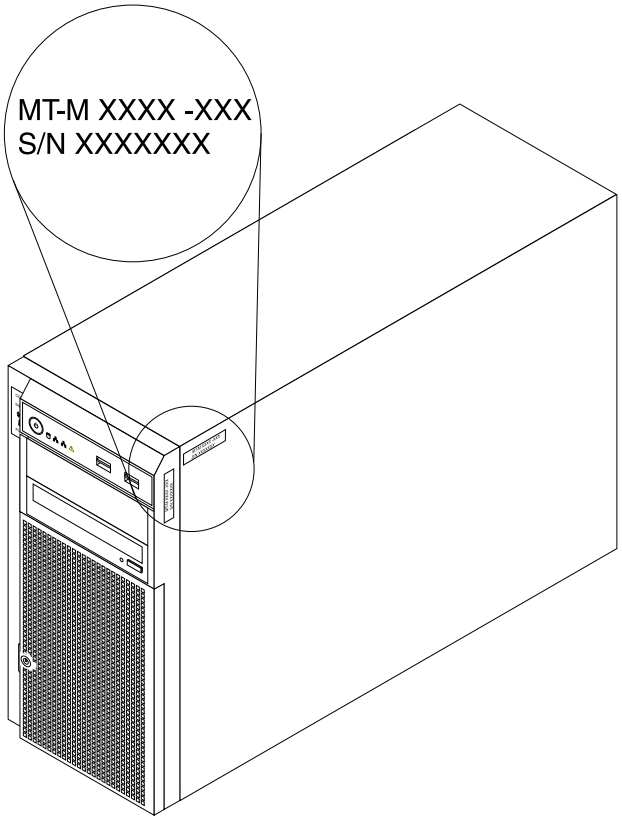


Figure 2. Machine type, model, and serial number labels

Front view of the server

This topic provides information to help you locate the parts on the front of the server.

The following illustration shows the front view of the server.

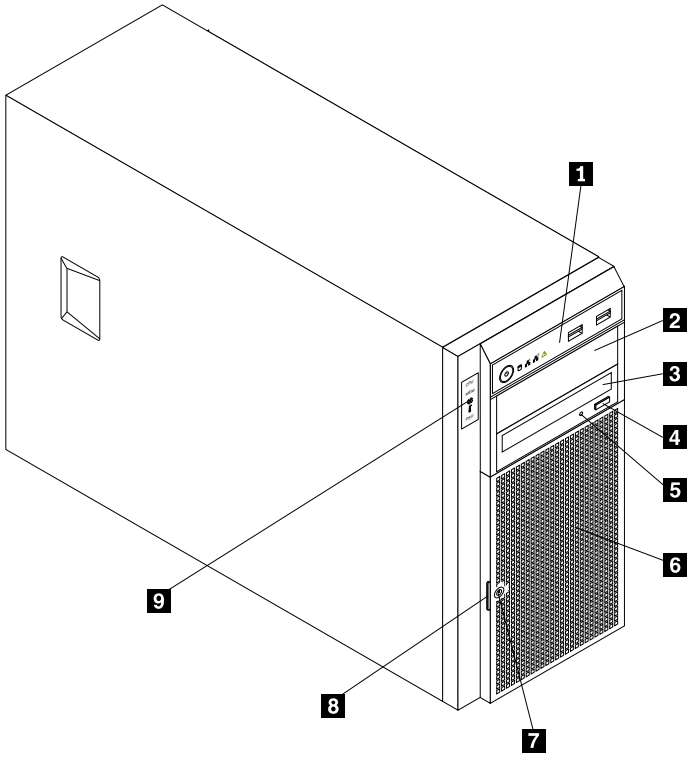


Figure 3. Front view of the server

1 Front panel	6 Front door
2 Optical drive bay 2 (with an optical drive installed in some models)	7 Front door lock
3 Optical drive bay 1 (with an optical drive installed)	8 Front door handle
4 Optical drive eject/close button	9 Doctor Inside Technology (DIT) panel (available in some models)
5 Optical drive status LED	

1 Front panel

For detailed information about the control, connectors, and status LEDs on the front panel, see “Front panel” on page 17.

2 Optical drive bay 2

The 5.25-inch optical drive bay 2 is for a secondary optical drive or a RDX USB drive bundle (server option). Some models have a secondary optical drive installed.

3 Optical drive bay 1

Your server comes with an optical drive installed in the 5.25-inch optical drive bay 1.

4 Optical drive eject/close button

Press this button to eject or close the optical drive when the server power is on.

5 Optical drive status LED

The optical drive status LED is blinking in green when the optical drive is working or in the POST process.

6 Front door

7 Front door lock

You can lock the front door to protect the hard disk drive cages from unauthorized access.

8 Front door handle

The front door handle helps you to open the front door.

9 DIT panel

The DIT panel is only available in models that come with a DIT module. For more information, see “DIT module” on page 18.

Front panel

This topic provides information to help you locate the control, connectors, and LEDs on the front panel of the server.

The following illustration shows the control, connectors, and LEDs on the front panel of the server. Depending on the model, your server might look slightly different from the following illustration.

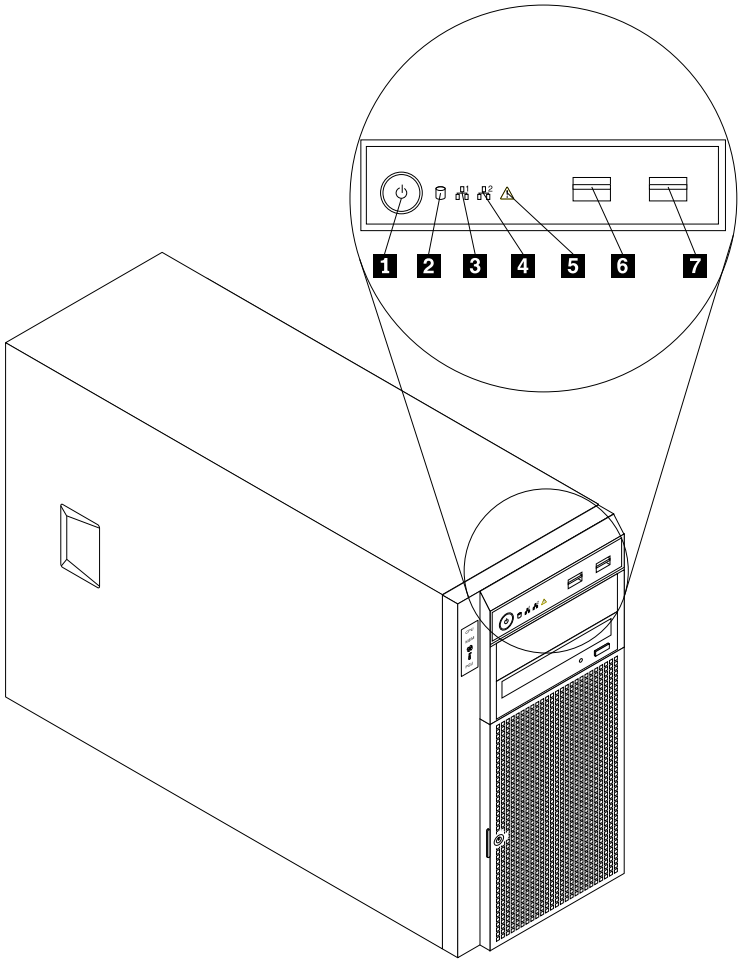


Figure 4. Front panel

1 Power switch with power status LED	5 System status LED
2 Hard disk drive status LED	6 Front USB connector 1
3 Network Interface Controller (NIC) 1 status LED	7 Front USB connector 2
4 NIC 2 status LED	

1 Power switch with power status LED

You can press the power switch to turn on the server when you finish setting up the server. You can also hold the power switch for several seconds to turn off the server if you cannot turn off the server from the operating system. See Chapter 4 “Turning on and turning off the server” on page 53. The power status LED helps you to determine the current power status.

Power status LED	Color	Description
On	Green	The server is on.
Off	None	The server is off.
Blinking	Green	The server is in ACPI S1 mode, which is also known as Power On Suspend (POS) mode. In this mode, the microprocessor is not working while other hardware devices are still working.

2 Hard disk drive status LED

The hard disk drive status LED helps you to determine the status of the hard disk drive activity.

Hard disk drive status LED	Color	Description
Off	None	The hard disk drive is not in use.
Blinking	Green	The hard disk drive is active and data is being transferred.

3 NIC 1 status LED

4 NIC 2 status LED

The two NIC status LEDs indicate the LAN status for the Ethernet connector 1 and Ethernet connector 2 on the rear panel of the server.

NIC status LED	Color	Description
On	Green	The server is connected to a LAN.
Off	None	The server is disconnected from a LAN.
Blinking	Green	The LAN is connected and active.

5 System status LED

The system status LED helps you to determine if there are any system errors.

System status LED	Color	Description
On	Amber	A system error has occurred.
Off	None	The server is off or the server is on and is working correctly.

6 Front USB connector 1

7 Front USB connector 2

Used to attach a device that requires a USB connector, such as a USB keyboard, a USB mouse, a USB scanner, or a USB printer. If you have more than six USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.

DIT module

This topic provides information about the DIT module and the diagnostic LEDs on the panel of the DIT module.

Note: The DIT module is only available in some models.

The following illustration shows the location of the DIT module and the diagnostic LEDs on the DIT panel in the front of the server. Depending on the model, your server might look slightly different from the following illustration.

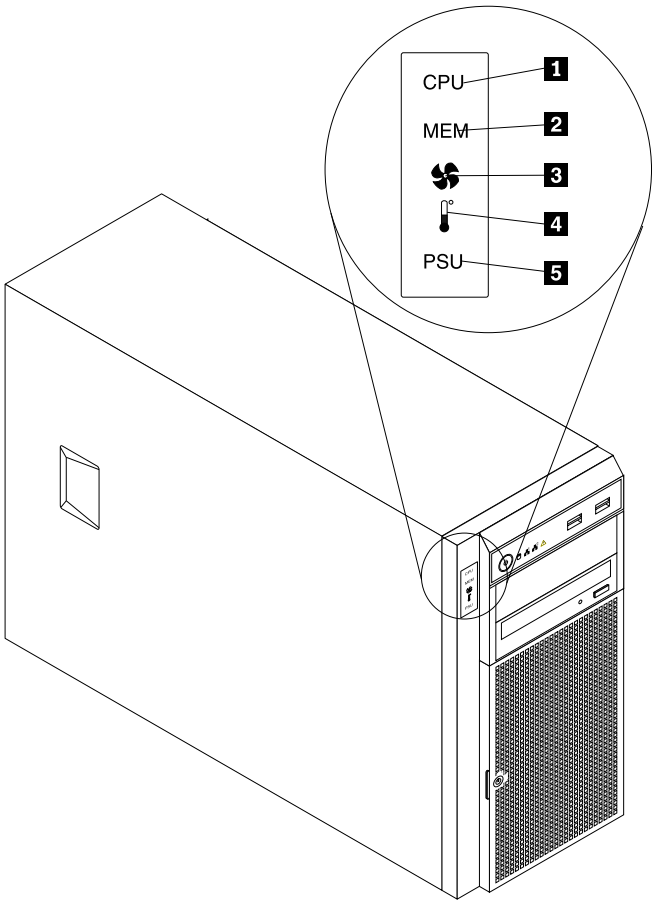


Figure 5. DIT panel

1 Microprocessor error LED	4 Ambient temperature over limit LED
2 Memory module error LED	5 Power supply error LED (only available on models with redundant power supply modules)
3 Fan error LED	

1 2 3 5 Error LEDs

When one of these error LEDs is lit (orange), it indicates that the associated component has failed.

4 Ambient temperature over limit LED

When this LED is lit (orange), it indicates that the ambient temperature is over 38°C (100.4°F).

Rear view of the server

This topic provides information to help you locate the connectors and components on the rear of your server.

The following illustration shows the rear view of the server with a screw-secured, non-hot-swap power supply.

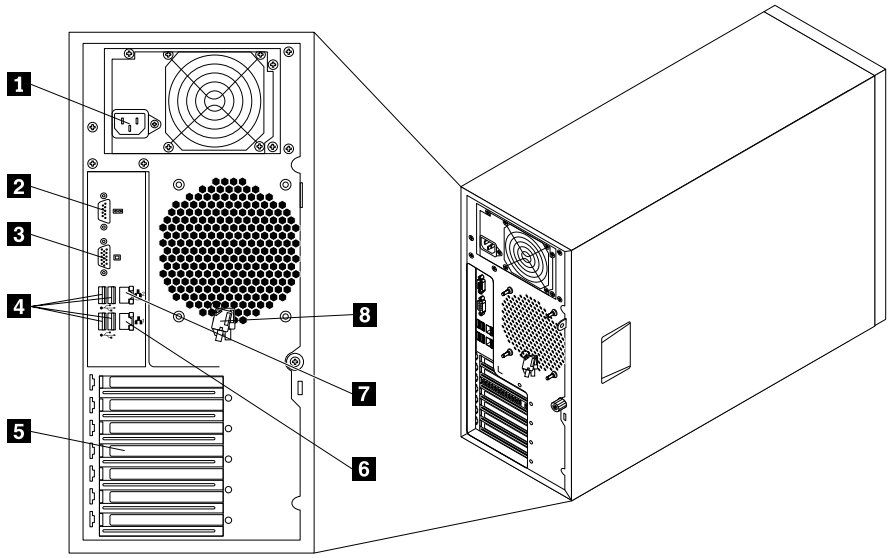


Figure 6. Rear view of the server with a non-hot-swap power supply

1 Power cord connector	5 Expansion card area
2 Serial port	6 Ethernet connector 1 (RJ-45)
3 VGA DB-15 connector	7 Ethernet connector 2 (RJ-45) (for system management)
4 Four USB connectors	8 Front door key

For server models that have hot-swap redundant power supply module(s), there might be one or two power cord connectors 1 on the rear of the server. For each hot-swap redundant power supply module, there might be one or two status LEDs on the power supply module near the power cord connector. When the green LED is lit, it indicates that the hot-swap redundant power supply module is working properly. When the red LED is lit, it indicates that the hot-swap redundant power supply module has failed.

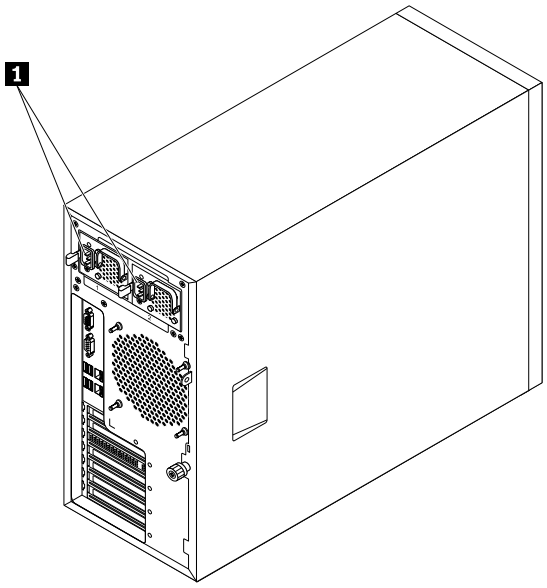


Figure 7. Rear view of the server with hot-swap redundant power supply modules

1 Power cord connector(s)

Used to connect the power cord(s).

2 Serial port

Used to attach a device that uses a 9-pin serial port.

3 VGA DB-15 connector

Used to attach a video device, such as a VGA monitor or other devices that use a VGA DB-15 connector.

4 USB connectors

Used to attach a device that requires a USB connector, such as a USB keyboard, a USB mouse, a USB scanner, or a USB printer. If you have more than six USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.

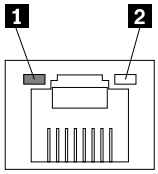
5 Expansion card area

You server has four expansion slots on the system board for you to install appropriate PCI cards. For detailed information, see “System board components” on page 42.

6 7 Ethernet connectors

Used to attach an Ethernet cable for a LAN. Each Ethernet connector has two status LEDs to help you identify the Ethernet connectivity, activity, and connection speed.

Note: The Ethernet connector 2 (callout 7) marked with “MGMT” is for system management. If you want to use remote management functions, you need to connect an Ethernet cable to the Ethernet connector 2.



Ethernet status LED	Color	Status	Description
1 Left	Green	On	The server is connected to a LAN.
	None	Off	The server is disconnected from a LAN.
	Green	Blinking	The LAN is connected and active.
2 Right	Amber	On	The connection speed is 1000 Mbps (megabits per second).
	Green	On	The connection speed is 100 Mbps.
	None	Off	The connection speed is 10 Mbps.

8 Front door key

Used to open or lock the front door.

Note: Carefully save the front door key to avoid loss.

Server locks

Locking the server cover helps prevent unauthorized access to the inside of your server and locking the front door helps prevent unauthorized access to the installed hard disk drives.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

Padlock

Your server comes with a padlock loop so that the server cover cannot be removed when a padlock is installed.

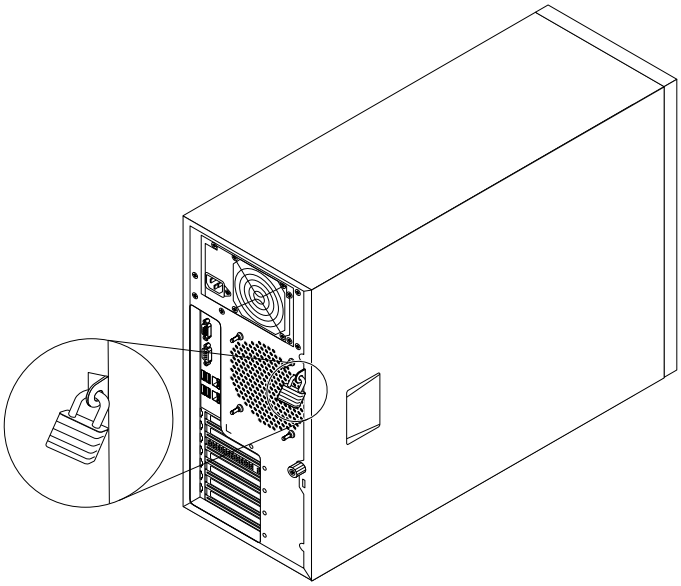


Figure 8. Padlock

Integrated cable lock

An integrated cable lock, sometimes referred to as the Kensington lock, can be used to secure your server to a non-permanent fixture. The cable lock attaches to the integrated cable lock slot at the rear of your server and is operated with a key. The cable lock also locks the server cover. This is the same type of lock used with many notebook computers. You can order an integrated cable lock directly from Lenovo by searching for **Kensington** at:
http://www.lenovo.com/support

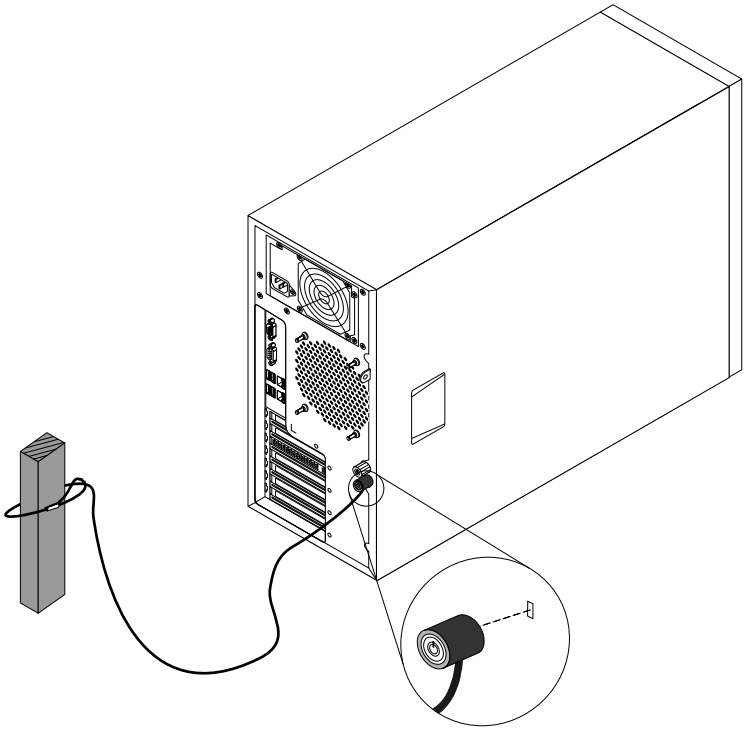


Figure 9. Integrated cable lock

Front door lock

You can remove the key attached on the server and use it to open or lock the front door of the server. The front door helps protect the hard disk drive cages to prevent unauthorized access to the installed hard disk drives.

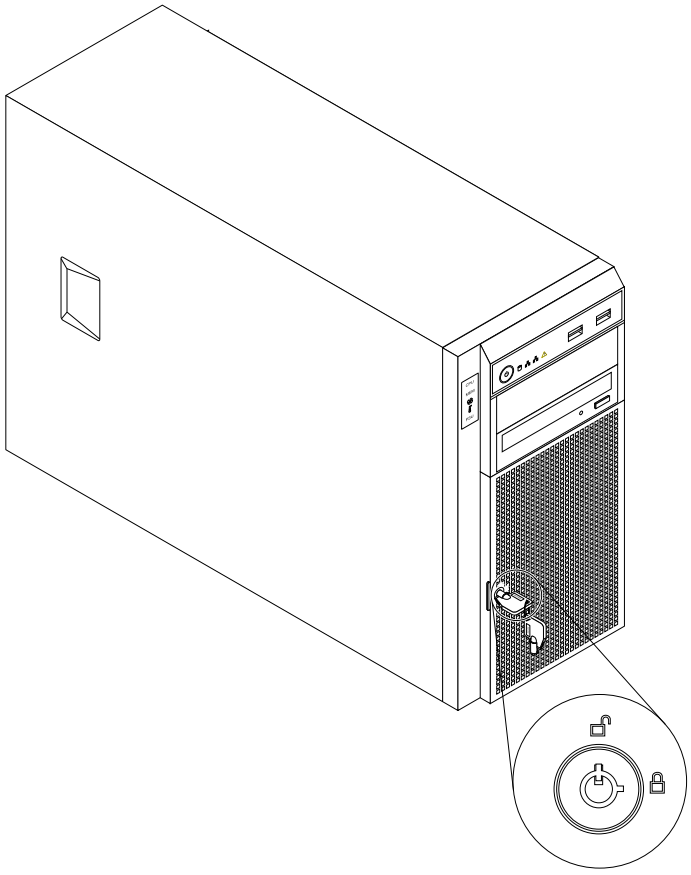


Figure 10. Front door lock

Server components

This topic provides information to help you locate the components of your server.

To remove the server cover and gain access to the inside of the server, see “Removing the server cover” on page 85.

The chassis configuration varies by model. The following illustrations show the four main chassis configurations based on the supported hard disk drives.

The following illustration shows the components of the server with five to eight 3.5-inch hot-swap hard disk drives.

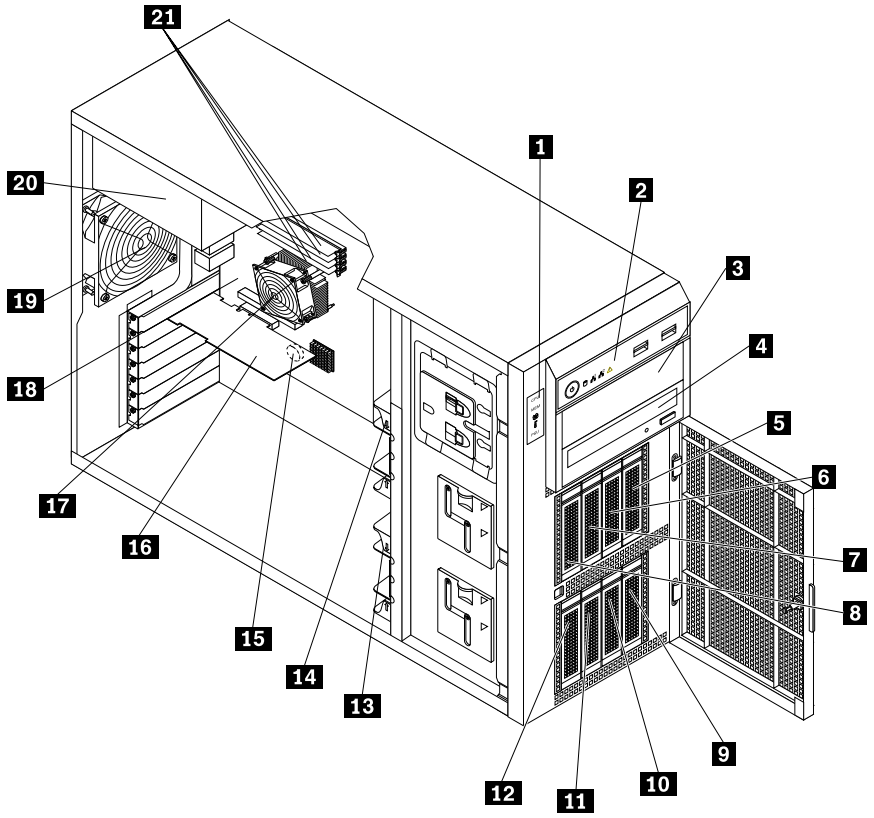


Figure 11. Components of the server with five to eight 3.5-inch hot-swap hard disk drives

1 DIT module (available in some models)	12 Hard disk drive bay 0
2 Front panel	13 Front system fan 1
3 Optical drive bay 2 (with an optical drive installed in some models)	14 Front system fan 2
4 Optical drive bay 1 (with an optical drive installed)	15 System board battery
5 Hard disk drive bay 7	16 Expansion card
6 Hard disk drive bay 6	17 Heat sink and fan assembly
7 Hard disk drive bay 5	18 System board
8 Hard disk drive bay 4	19 Rear system fan
9 Hard disk drive bay 3	20 Power supply
10 Hard disk drive bay 2	21 Four memory slots (installed memory modules vary by model)
11 Hard disk drive bay 1	

- For more information about 1 to 4, see “Front view of the server” on page 15.

  Note: The DIT module 1 is only available in some models and the DIT panel also varies by model. See “DIT module” on page 18.

- There is a 3.5-inch hot-swap hard disk drive or a dummy hard disk drive tray installed in each hard disk drive bay (5 to 12).

  Note: The number of the installed hard disk drives varies by model. For the vacant drive bay, there is a dummy hard disk drive tray to cover the place.
- For information about the supported expansion card, see “System board components” on page 42.
- Depending on the model, your server might come with a screw-secured, non-hot-swap power supply or hot-swap redundant power supply module(s).
- For more information about the memory modules, see “Memory module installation rules” on page 90.

The following illustration shows the components of the server with up to eight 2.5-inch hot-swap SAS hard disk drives.

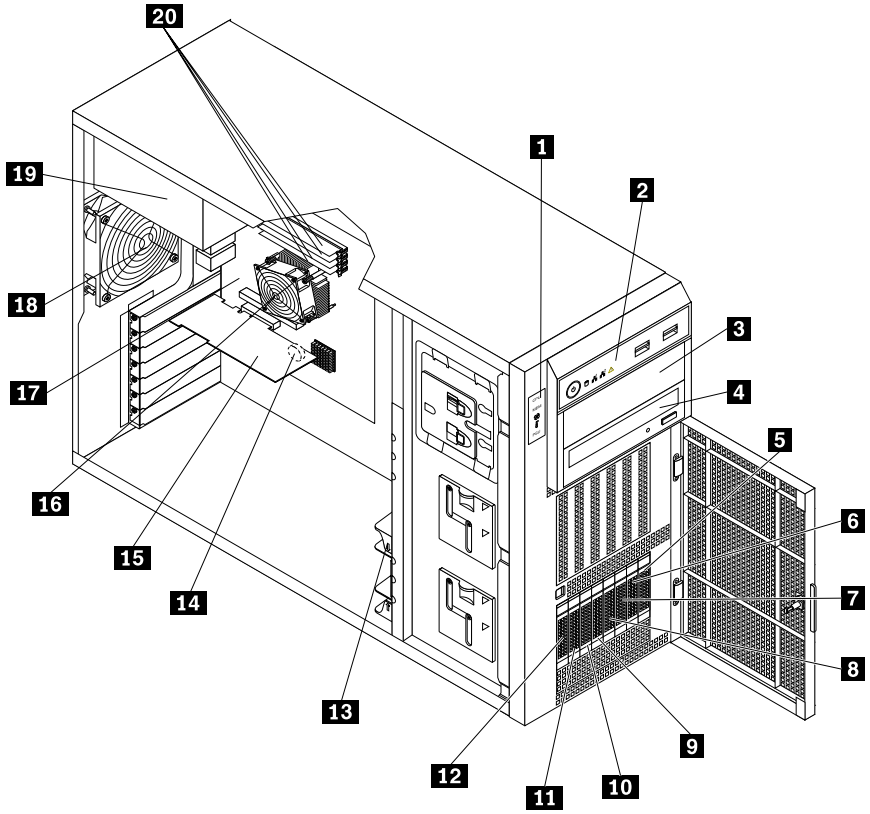


Figure 12. Components of the server with up to eight 2.5-inch hot-swap SAS hard disk drives

1 DIT module (available in some models)	11 Hard disk drive bay 1
2 Front panel	12 Hard disk drive bay 0
3 Optical drive bay 2 (with an optical drive installed in some models)	13 Front system fan 1
4 Optical drive bay 1 (with an optical drive installed)	14 System board battery
5 Hard disk drive bay 7	15 Expansion card
6 Hard disk drive bay 6	16 Heat sink and fan assembly
7 Hard disk drive bay 5	17 System board
8 Hard disk drive bay 4	18 Rear system fan
9 Hard disk drive bay 3	19 Power supply
10 Hard disk drive bay 2	20 Four memory slots (installed memory modules vary by model)

- For more information about 1 to 4, see “Front view of the server” on page 15.

  Note: The DIT module 1 is only available in some models and the DIT panel also varies by model. See “DIT module” on page 18.

- There is a 2.5-inch hot-swap SAS hard disk drive or a dummy hard disk drive tray installed in each hard disk drive bay (5 to 12).

Note: The number of the installed hard disk drives varies by model. For the vacant drive bay, there is a dummy hard disk drive tray to cover the place.

- For information about the supported expansion card, see “System board components” on page 42.
- Depending on the model, your server might come with a screw-secured, non-hot-swap power supply or hot-swap redundant power supply module(s).
- For more information about the memory modules, see “Memory module installation rules” on page 90.

The following illustration shows the components of the server with up to four 3.5-inch hot-swap hard disk drives.

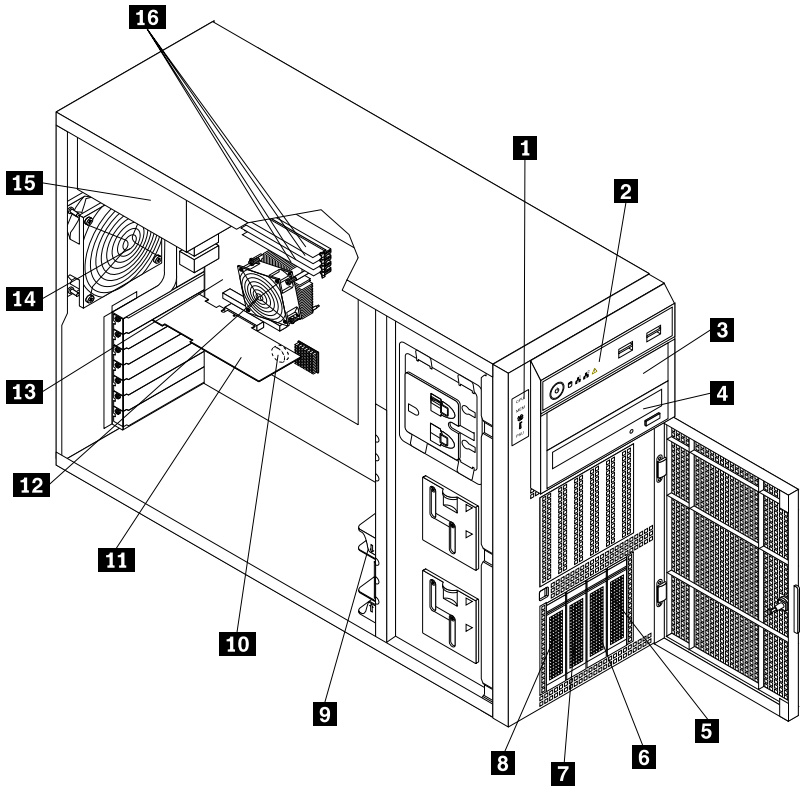


Figure 13. Components of the server with up to four 3.5-inch hot-swap hard disk drives

1 DIT module (available in some models)	9 Front system fan 1
2 Front panel	10 System board battery
3 Optical drive bay 2 (with an optical drive installed in some models)	11 Expansion card (varies by model)
4 Optical drive bay 1 (with an optical drive installed)	12 Heat sink and fan assembly
5 Hard disk drive bay 3	13 System board
6 Hard disk drive bay 2	14 Rear system fan
7 Hard disk drive bay 1	15 Power supply
8 Hard disk drive bay 0	16 Four memory slots (installed memory modules vary by model)

- For more information about 1 to 4, see “Front view of the server” on page 15.

Note: The DIT module 1 is only available in some models and the DIT panel also varies by model. See “DIT module” on page 18.

- There is a 3.5-inch hot-swap hard disk drive or a dummy hard disk drive tray installed in each hard disk drive bay (5 to 8).

  Note: The number of the installed hard disk drives varies by model. For the vacant drive bay, there is a dummy hard disk drive tray to cover the place.

- For information about the supported expansion card, see “System board components” on page 42.
- Depending on the model, your server might come with a screw-secured, non-hot-swap power supply or hot-swap redundant power supply module(s).
- For more information about the memory modules, see “Memory module installation rules” on page 90.

The following illustration shows the components of the server with up to four 3.5-inch non-hot-swap hard disk drives.

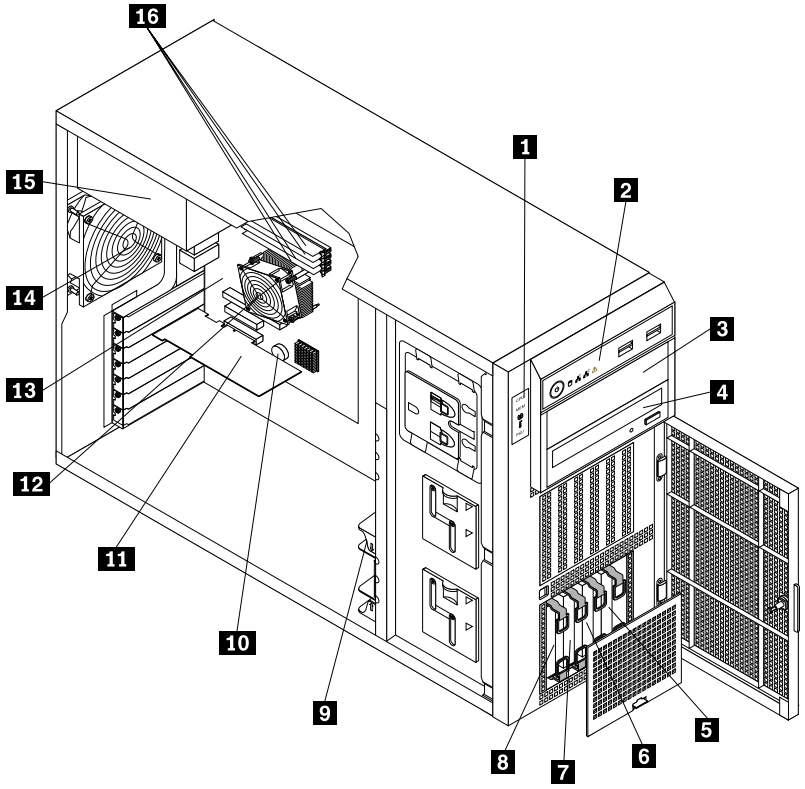


Figure 14. Components of the server with up to four 3.5-inch non-hot-swap hard disk drives

1 DIT module (available in some models)	9 Front system fan 1
2 Front panel	10 System board battery
3 Optical drive bay 2 (with an optical drive installed in some models)	11 Expansion card (varies by model)
4 Optical drive bay 1 (with an optical drive installed)	12 Heat sink and fan assembly
5 Hard disk drive bay 3	13 System board
6 Hard disk drive bay 2	14 Rear system fan
7 Hard disk drive bay 1	15 Power supply
8 Hard disk drive bay 0	16 Four memory slots (installed memory modules vary by model)

- For more information about 1 to 4, see “Front view of the server” on page 15.

  Note: The DIT module 1 is only available in some models and the DIT panel also varies by model. See “DIT module” on page 18.
- Each of the hard disk drive bay (5 to 8) is used for installing a 3.5-inch non-hot-swap hard disk drives.

  Note: The number of the installed hard disk drives varies by model.
- For information about the supported expansion card, see “System board components” on page 42.

- Depending on the model, your server might come with a screw-secured, non-hot-swap power supply or hot-swap redundant power supply module(s).
- For more information about the memory modules, see “Memory module installation rules” on page 90.

Hot-swap hard disk drive status LEDs

This topic applies only to server models with hot-swap hard disk drives.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

Each hot-swap hard disk drive has two status LEDs on the front. Unlock and open the front door to gain access to the hard disk drives and view the status LEDs.

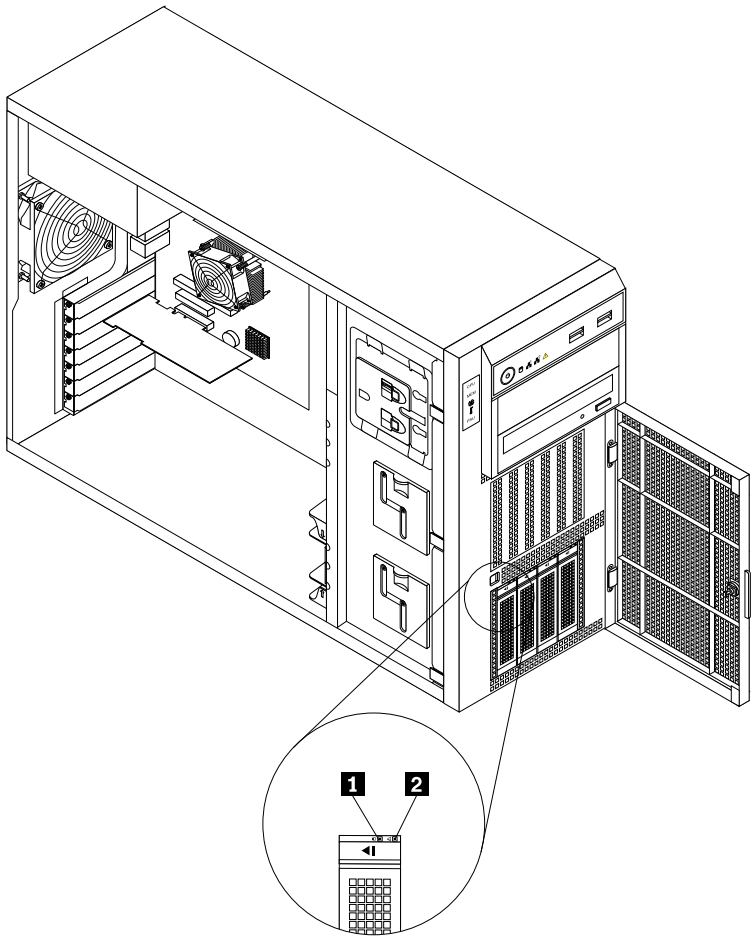


Figure 15. 3.5-inch hot-swap hard disk drive status LEDs

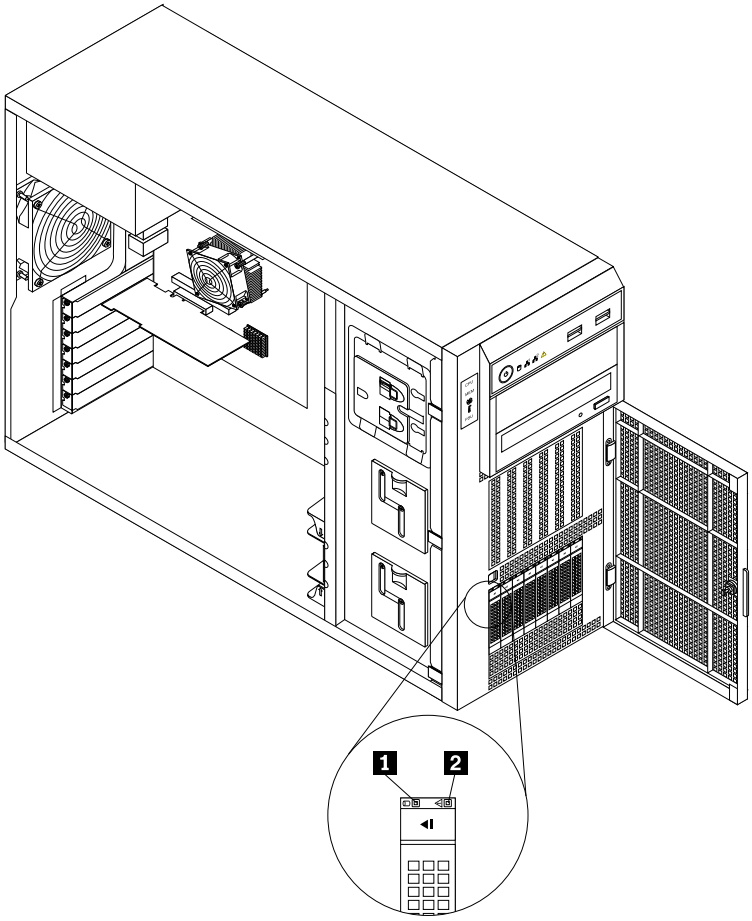


Figure 16. 2.5-inch hot-swap hard disk drive status LEDs

1 Hard disk drive activity LED	2 Hard disk drive RAID status LED	Description
Off	Off	The hard disk drive has failed or is not present.
On, green	Off	The hard disk drive is present but not in use.
Blinking, green	Off	The hard disk drive is active and data is being transferred.
On, green	Blinking rapidly (about four flashes per second), amber	The RAID controller is identifying the hard disk drive.
On, green	On, amber	The RAID array has failed and cannot recover. You need to recreate a new array.
Blinking, green	Blinking slowly (about one flash per second), amber	The hard disk drive is being rebuilt.

RAID card

This topic provides information to help you locate the connectors on a RAID card if you have one installed in the PCI-E slot 3 on the system board. See “System board components” on page 42.

Some server models come with a required RAID card to provide advanced SATA/SAS hardware RAID functions to the server. You can also purchase the RAID card from Lenovo and install it into models that support the RAID card to get advanced SATA/SAS hardware RAID functions. See “Installing or removing the RAID card” on page 98.

Note: For server models with more than four hard disk drives or models that use SAS hard disk drives, there must be a RAID card installed.

Option name: ThinkServer 9240-8i RAID 0/1 Adapter (hereinafter referred to as the RAID card)

The following illustration shows the connectors on the RAID card.

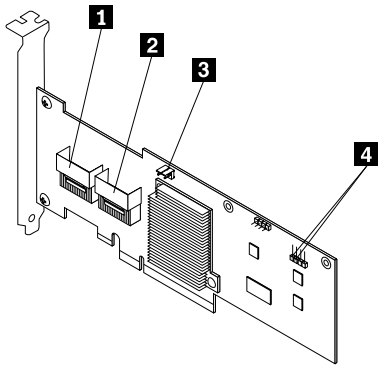


Figure 17. ThinkServer 9240-8i RAID 0/1 Adapter

1 Port 0	3 RAID 5 key connector
2 Port 1	4 External connector

1 Port 0

Used to connect a mini-SAS signal cable. See “Connecting cables” on page 38.

2 Port 1

Used to connect a mini-SAS signal cable. See “Connecting cables” on page 38.

3 RAID 5 key connector

Used to connect a ThinkServer 9240-8i RAID 5 Upgrade Key. See “Installing or removing the ThinkServer 9240-8i RAID 5 Upgrade Key” on page 100.

4 External connector

Used to connect a 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable. See “Connecting cables” on page 38.

Hot-swap hard disk drive backplane

Your server supports the following hot-swap hard disk drive and backplane configurations:

- Five to eight 3.5-inch hot-swap SATA or SAS hard disk drives with two backplanes
- Up to four 3.5-inch hot-swap SATA or SAS hard disk drives with one backplane

- Up to eight 2.5-inch hot-swap SAS hard disk drives with one backplane

The following illustration shows the locations of the hot-swap hard disk drive backplanes. You need to open the server cover and remove the front system fans to access the backplanes. See “Removing the server cover” on page 85 and “Replacing the front system fan” on page 149.

Notes:

1. Depending on the model, your server might look slightly different from the illustration in this topic.
2. The following illustration is based on five to eight 3.5-inch hot-swap SATA or SAS hard disk drives with two backplanes **1**.

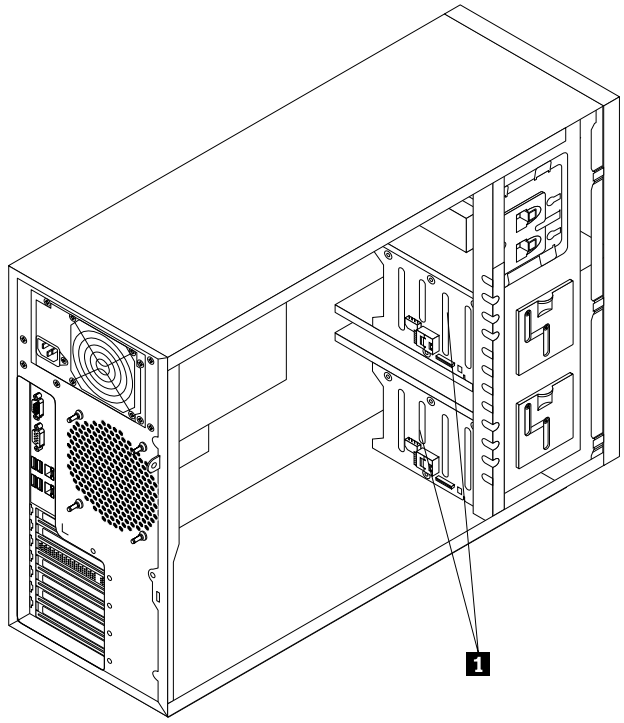


Figure 18. Hot-swap hard disk drive backplane locations

Backplane for 3.5-inch hot-swap hard disk drives

This topic provides information to help you locate the connectors on a 3.5-inch hot-swap hard disk drive backplane.

The following illustrations show the connectors on a 3.5-inch hot-swap hard disk drive backplane.

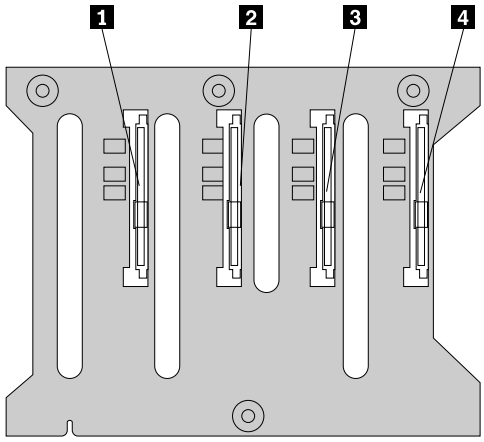


Figure 19. Front view of the 3.5-inch hot-swap hard disk drive backplane

1 Slot 0 for a 3.5-inch SATA or SAS hot-swap hard disk drive	**3** Slot 2 for a 3.5-inch SATA or SAS hot-swap hard disk drive
2 Slot 1 for a 3.5-inch SATA or SAS hot-swap hard disk drive	**4** Slot 3 for a 3.5-inch SATA or SAS hot-swap hard disk drive

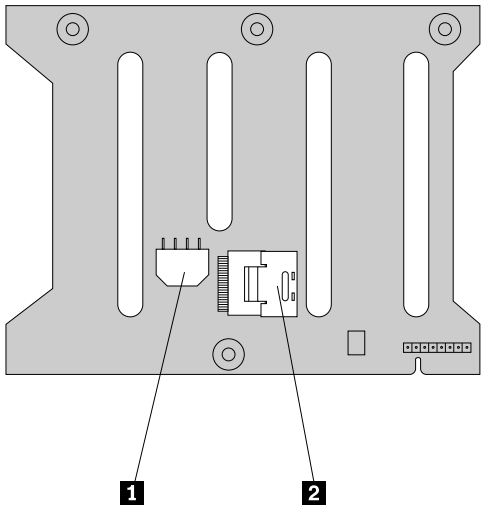


Figure 20. Rear view of the 3.5-inch hot-swap hard disk drive backplane

1 8-pin power connector

- For 3.5-inch hot-swap hard disk drive backplane on the lower hard disk drive cage, connect the P5 power connector of the power supply to the 8-pin power connector on the backplane.
- For 3.5-inch hot-swap hard disk drive backplane on the upper hard disk drive cage, connect the P4 power connector of the power supply to the 8-pin power connector on the backplane.

2 Mini-SAS signal cable connector

Used to connect the mini-SAS connector on one end of the mini-SAS signal cable.

Backplane for 2.5-inch hot-swap hard disk drives

This topic provides information to help you locate the connectors on the 2.5-inch hot-swap hard disk drive backplane.

The following illustrations show the connectors on the 2.5-inch hot-swap hard disk drive backplane.

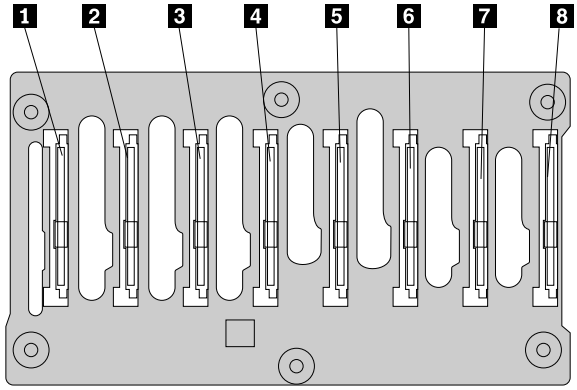


Figure 21. Front view of the 2.5-inch hot-swap hard disk drive backplane

1 Slot 0 for a 2.5-inch SAS hot-swap hard disk drive	**5** Slot 4 for a 2.5-inch SAS hot-swap hard disk drive
2 Slot 1 for a 2.5-inch SAS hot-swap hard disk drive	**6** Slot 5 for a 2.5-inch SAS hot-swap hard disk drive
3 Slot 2 for a 2.5-inch SAS hot-swap hard disk drive	**7** Slot 6 for a 2.5-inch SAS hot-swap hard disk drive
4 Slot 3 for a 2.5-inch SAS hot-swap hard disk drive	**8** Slot 7 for a 2.5-inch SAS hot-swap hard disk drive

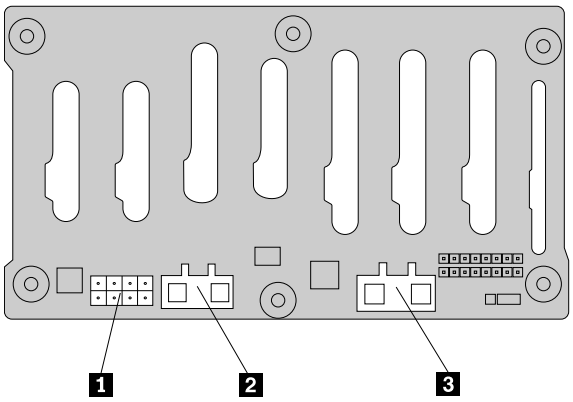


Figure 22. Rear view of the 2.5-inch hot-swap hard disk drive backplane

1 8-pin power connector

Used to connect the P5 power connector of the power supply.

2 Mini-SAS signal cable connector 2

Used to connect the mini-SAS connector on one end of the mini-SAS signal cable.

3 Mini-SAS signal cable connector 1

Used to connect the mini-SAS connector on one end of the mini-SAS signal cable.

Connecting cables

This topic provides instructions on how to connect the mini-SAS signal cable(s) to the hot-swap hard disk drive backplane(s) and the system board or the required RAID card if you have one installed.

This topic applies only to server models that have hot-swap hard disk drive(s) installed and the cable connections are different depending on the following configurations:

- Server models with five to eight 3.5-inch hot-swap hard disk drives and two backplanes
- Server models with up to eight 2.5-inch SAS hot-swap hard disk drives and one backplane
- Server models with up to four 3.5-inch hot-swap hard disk drives and one backplane

Server models with five to eight 3.5-inch hot-swap hard disk drives and two backplanes

For server models with five to eight SAS or SATA II 3.5-inch hot-swap hard disk drives and two backplanes, a required RAID card must be installed in the server.

The following cables that come with the RAID card are required:

Note: The option package for the RAID card is designed for different types of servers and might contain additional cables that are not required to be installed into your server.

- Two 700 mm (27.56 inches) mini-SAS to mini-SAS signal cables
- One 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable

Use the following instructions to connect the cables:

1. Use one 700 mm (27.56 inches) mini-SAS to mini-SAS signal cable. Connect the mini-SAS connector 1 to the port 0 on the RAID card. Then, connect the mini-SAS connector 2 to the mini-SAS signal cable connector on the 3.5-inch hot-swap hard disk drive backplane installed on the lower hard disk drive cage.
2. Use the other 700 mm (27.56 inches) mini-SAS to mini-SAS signal cable. Connect the mini-SAS connector 5 to the port 1 on the RAID card. Then, connect the mini-SAS connector 6 to the mini-SAS signal cable connector on the 3.5-inch hot-swap hard disk drive backplane installed on the upper hard disk drive cage.
3. Use the 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable. Connect the end 4 to the external connector on the RAID card and the end 3 to the hard disk drive LED connector on the system board.

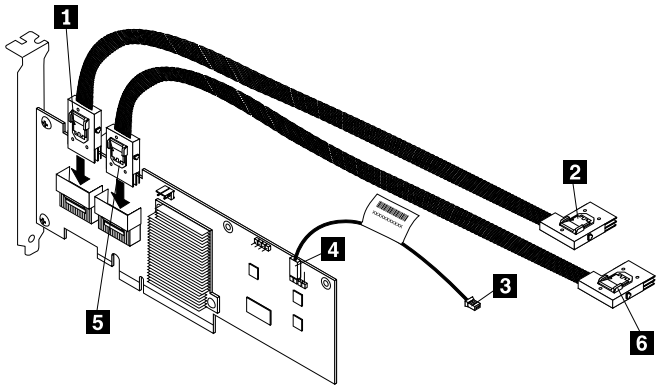


Figure 23. Connecting cables for server models with two backplanes and a RAID card

For connector location information about the RAID card, hot-swap hard disk drive backplane, and the system board, refer to the related topics in “Locations” on page 13.

For information about connecting the appropriate power connector of the power supply to the backplane, see “Hot-swap hard disk drive backplane” on page 34.

Server models with up to eight 2.5-inch SAS hot-swap hard disk drives and one backplane

For server models with up to eight 2.5-inch SAS hot-swap hard disk drives and one backplane, a required RAID card must be installed in the server.

The following cables that come with the RAID card are required:

Note: The option package for the RAID card is designed for different types of servers and might contain additional cables that are not required to be installed into your server.

- One or two 700 mm (27.56 inches) mini-SAS to mini-SAS signal cables depending on the number of the hard disk drives installed
- One 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable

Use the following instructions to connect the cables:

1. Use one 700 mm (27.56 inches) mini-SAS to mini-SAS signal cable. Connect the mini-SAS connector 1 to the port 0 on the RAID card. Then, connect the mini-SAS connector 2 to the mini-SAS signal cable connector 1 on the 2.5-inch hot-swap hard disk drive backplane.
2. If you have more than four 2.5-inch hard disk drives installed, use the other 700 mm (27.56 inches) mini-SAS to mini-SAS signal cable. Connect the mini-SAS connector 5 to the port 1 on the RAID card. Then, connect the mini-SAS connector 6 to the mini-SAS signal cable connector 2 on the 2.5-inch hot-swap hard disk drive backplane.
3. Use the 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable. Connect the end 4 to the external connector on the RAID card and the end 3 to the hard disk drive LED connector on the system board.

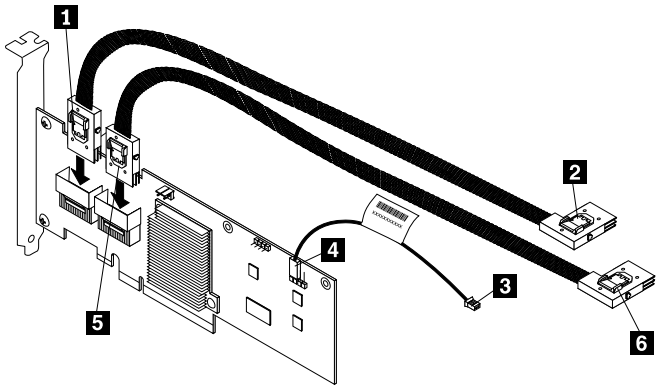


Figure 24. Connecting cables for server models with one 2.5-inch hot-swap hard disk drive backplane and a RAID card

For connector location information about the RAID card, hot-swap hard disk drive backplane, and the system board, refer to the related topics in “Locations” on page 13.

For information about connecting the appropriate power connector of the power supply to the backplane, see “Hot-swap hard disk drive backplane” on page 34.

Server models with up to four 3.5-inch hot-swap hard disk drives and one backplane

For server models with up to four 3.5-inch SATA hot-swap hard disk drives and one backplane, you can either connect the SATA hard disk drive(s) to the SATA connectors on the system board or a required RAID card if you have one installed in the server. For server models with up to four 3.5-inch SAS hot-swap hard disk drives and one backplane, connect the SAS hard disk drive(s) to the required RAID card installed in the server.

Note: SATA II is the only type of SATA supported by the RAID card.

Use the following instructions to connect the cables:

If you are connecting the SATA hard disk drives to the system board, use the 450 mm (17.72 inches) mini-SAS signal cable with four SATA ports and one Serial General Purpose Input/Output (SGPIO) port. Connect the mini-SAS connector 1 to the mini-SAS signal cable connector on the 3.5-inch hot-swap hard disk drive backplane and connect the four SATA ports 3 – 6 to the SATA connector 0 to SATA connector 3 on the system board. Then, connect the SGPIO port 2 to the SATA SGPIO connector on the system board.

Notes:

1. The number on the label for each of the four SATA signal cables indicates the sequence when you are connecting the cables to the corresponding SATA connectors (0-3) on the system board.

SATA signal cable label	System board SATA connector
P0	SATA connector 0
P1	SATA connector 1
P2	SATA connector 2
P3	SATA connector 3

2. If you connect the SATA hard disk drives to the system board, you can configure RAID using the configuration utility for the onboard SATA software RAID. See “Configuring the onboard SATA software RAID” on page 75.

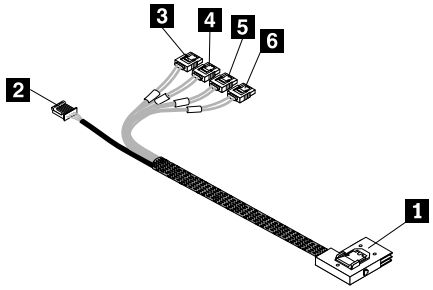


Figure 25. Mini-SAS signal cable with four SATA ports and one SGPIO port

The RAID card provides advanced SATA/SAS RAID configurations. If you are using SAS hot-swap hard disk drives, you must have the RAID card for connecting the SAS hard disk drives. To connect the hard disk drives to the installed RAID card, the following cables that come with the RAID card are required:

Note: The option package for the RAID card is designed for different types of servers and might contain additional cables that are not required to be installed into your server.

- One 700 mm (27.56 inches) mini-SAS to mini-SAS signal cable
- One 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable

To connect the cables, do the following:

1. Use the 700 mm (27.56 inches) mini-SAS to mini-SAS signal cable. Connect the mini-SAS connector 1 to the port 0 on the RAID card. Then, connect the mini-SAS connector 2 to the mini-SAS signal cable connector on the 3.5-inch hot-swap hard disk drive backplane.
2. Use the 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable. Connect the end 4 to the external connector on the RAID card and the end 3 to the hard disk drive LED connector on the system board.

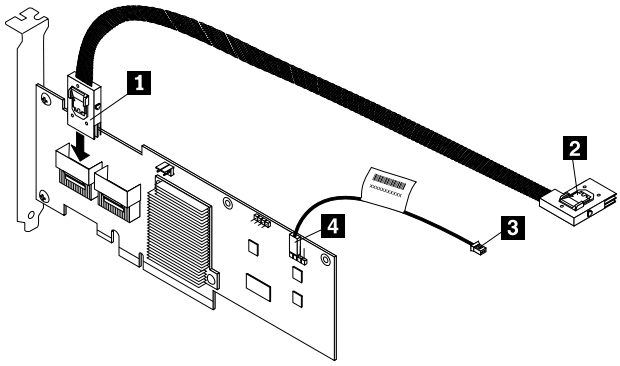


Figure 26. Connecting cables for server models with one 3.5-inch hot-swap hard disk drive backplane and a RAID card

For connector location information about the RAID card, hot-swap hard disk drive backplane, and the system board, refer to the related topics in “Locations” on page 13.

For information about connecting the appropriate power connector of the power supply to the backplane, see “Hot-swap hard disk drive backplane” on page 34.

System board components

Your server system board is a six-layer micro-ATX board based on the Intel Bromolow platform. The following illustration shows the component locations on the system board.

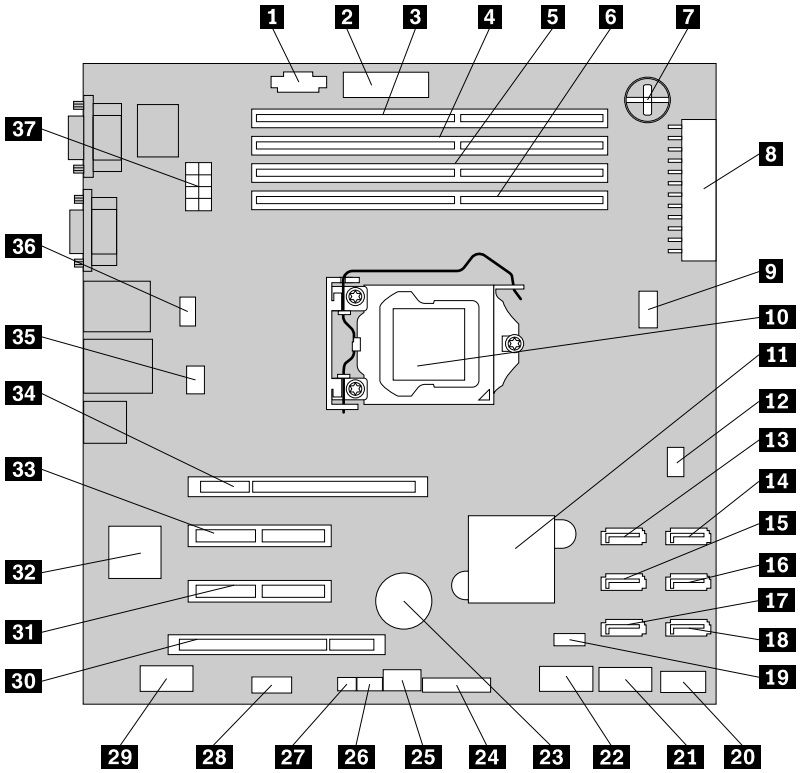


Figure 27. System board components

1 Power Management Bus (PMBus) connector	20 Internal USB 2.0 Type A connector
2 TPM connector	21 Internal dual-port USB 2.0 connector 2
3 Memory slot 4 (DIMMB2)	22 Internal dual-port USB 2.0 connector 1
4 Memory slot 3 (DIMMB1)	23 System board battery
5 Memory slot 2 (DIMMA2)	24 Front panel connector
6 Memory slot 1 (DIMMA1)	25 System board jumper blocks
7 iButton socket	26 SATA SGPIO connector
8 Main power connector	27 Hard disk drive LED connector
9 5-pin system fan 2 connector	28 DIT module connector
10 Microprocessor	29 Internal serial connector
11 Intel C202 chip	30 PCI card slot (PCI slot 1)
12 4-pin system fan 1 connector	31 PCI Express x4 card slot (PCI-E slot 2)
13 SATA connector 1	32 BMC chip
14 SATA connector 0	33 PCI Express x8 card slot (PCI-E slot 3)
15 SATA connector 3	34 PCI Express x8 card slot (PCI-E slot 4)
16 SATA connector 2	35 Microprocessor fan connector
17 SATA connector 5	36 System fan 3 connector
18 SATA connector 4	37 Microprocessor power connector
19 iKVM key connector	

1 PMBus connector

The BMC can read the power supply status registered through PMBus. You do not need to connect any device to the PMBus connector. This connector is kept for power management in models with redundant power supply modules. The function of the PMBus connector is not available for models with a screw-secured non-hot-swap power supply.

2 TPM connector

Used to connect a TPM module, which is a security chip, to protect your server and strengthen server security. See “Installing or removing the TPM module” on page 109.

3 – 6 Memory slots

Your server system board provides four memory slots to support up to four memory modules. For more information, see “Memory module installation rules” on page 90.

7 iButton socket

Your server supports onboard SATA software RAID levels 0, 1, and 10. However, you can activate onboard SATA software RAID 5 by installing a ThinkServer SATA Software RAID 5 activation key in the iButton socket. For more information, see “Installing or removing the ThinkServer SATA Software RAID 5 Key” on page 102.

8 Main power connector

Used to connect the 24-pin P1 power connector of the power supply to provide main power to your server.

9 5-pin system fan 2 connector

Used to connect the cable of the upper front system fan (front system fan 2) if your server model has two front system fans.

10 Microprocessor

A microprocessor incorporates most or all of the functions of a computer's central processing unit (CPU) on a single integrated circuit. The microprocessor for your server is secured in the microprocessor socket on the system board and a heat sink and fan assembly is installed above the microprocessor to provide cooling. For more information about your microprocessor type, see “Features” on page 7.

11 Intel C202 chip

The Intel C202 chip on the system board serves as a platform controller hub (PCH), which provides the data buffering and interface arbitration required to ensure that system interfaces operate efficiently and provides the bandwidth necessary to enable the system to obtain peak performance. The chip supports and provides many features, including the onboard SATA software RAID.

12 4-pin system fan 1 connector

Used to connect the cable of the lower front system fan (front system fan 1).

13 – 18 SATA connectors

Used to connect SATA signal cables for the SATA hard disk drives or SATA optical drives.

19 iKVM key connector

Used to connect an iKVM key option, which is a kind of remote management module, to enable the iKVM function on your server. See “Installing or removing the ThinkServer iKVM Remote Management Module” on page 105.

20 Internal USB 2.0 Type A connector

Used to connect a device that uses a USB 2.0 Type A connector.

21 Internal dual-port USB 2.0 connector 2

Used to connect the USB cable of the RDX USB drive bundle (server option).

22 Internal dual-port USB 2.0 connector 1

Used to connect the front panel USB cable.

23 System board battery

Your server has a special type of memory that maintains the date, time, and configuration information for built-in features. The system board battery keeps the information active when you turn off the server.

24 Front panel connector

Used to connect the front panel cable.

25 System board jumper blocks

Used to configure the system board and your server. See “System board jumpers” on page 46.

26 SATA SGPIO connector

Used to connect the SGPIO port of the mini-SAS signal cable with four SATA ports and one SGPIO port to enable the RAID status LEDs for hot-swap hard disk drives.

27 Hard disk drive LED connector

Used to connect a 2-pin 200 mm (7.87 inches) RAID card to system board hard disk drive LED cable. See “Connecting cables” on page 38.

28 DIT module connector

Used to connect the cable of the DIT module if your server has one installed.

29 Internal serial connector

Used to provide an optional serial connector solution with a required cable.

30 PCI card slot (PCI slot 1)

Used to install a standard 32-bit 33 MHz PCI card with 167 mm (6.57 inches) in length.

31 PCI Express x4 card slot (PCI-E slot 2)

This is a PCI Express x4 lane in physical PCI 2.0 x8 slot that supports a PCI Express x4 card with 167 mm (6.57 inches) in length, such as an Ethernet card.

32 BMC chip

With the integrated BMC chip, no matter what condition the server operating system is in and no matter if the server is on or off, as long as the server is connected to network and an ac power source, the interaction with the BMC controlled servers can be achieved through system network. The user can obtain the server hardware health information and SEL, and is able to conduct the operations including turning on or of the server, restarting the server, locking the power switch on the front panel and so on. This part of the server management is independent of the operating system and is called out-of-band management.

33 PCI Express x8 card slot (PCI-E slot 3)

This is a PCI Express x8 lane in physical PCI 2.0 x8 slot that supports a PCI Express x8 card with 167 mm (6.57 inches) in length, such as an Ethernet card or a RAID card.

34 PCI Express x8 card slot (PCI-E slot 4)

This is a PCI Express x8 lane in physical PCI 2.0 x16 slot that supports a PCI Express x8 card with 312 mm (12.28 inches) in length, such as a graphics card.

35 Microprocessor fan connector

Used to connect the heat sink and fan assembly cable.

36 System fan 3 connector

Used to connect the rear system fan cable.

37 Microprocessor power connector

Used to connect the 8-pin P2 power connector of the power supply to provide power to your microprocessor.

System board jumpers

This topic provides information about the jumpers on the system board.

A jumper is a short length of conductor used to set up or adjust printed circuit boards, such as the system board of a computer. A jumper is usually encased in a non-conductive block of plastic for convenient use and avoiding any possible damage to a live circuit. Jumper pins arranged in groups on the system board are called jumper blocks. When two or more jumper pins are capped with a jumper, an electrical connection is made between them and the equipment is thus instructed to activate certain settings accordingly.

The following illustration shows a jumper in the default setting position (pin 1 and pin 2). This is the correct position for normal operation.

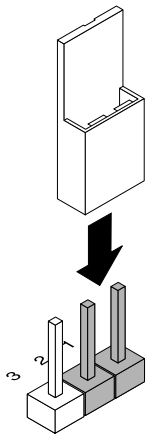


Figure 28. Default jumper setting

The following illustration shows the status of the jumpers on the system board of your server. You can configure, recover, enable, or disable some specific features of the system board by setting the jumpers.

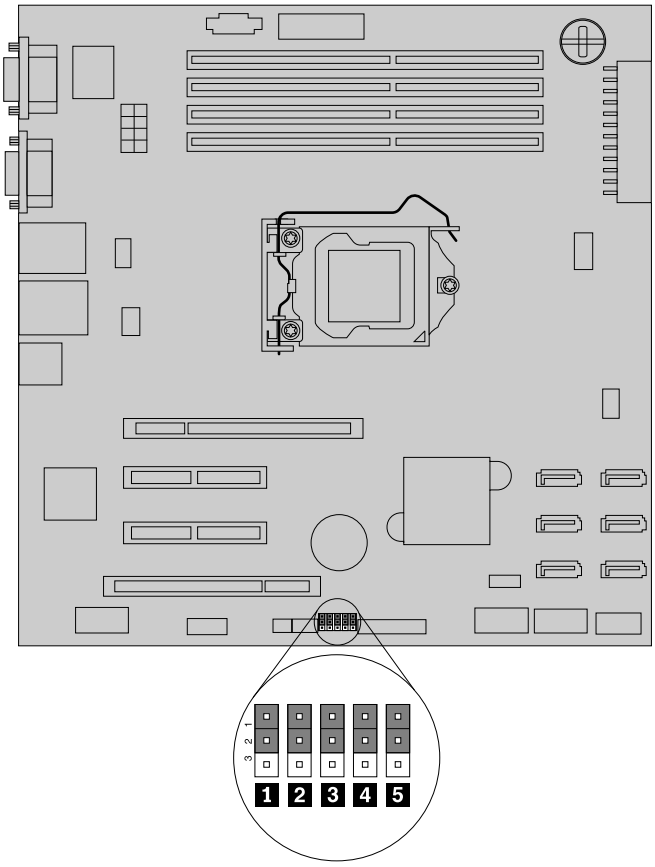


Figure 29. System board jumpers

1 Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper	**4** Clear password jumper
2 BMC setting jumper	**5** Manufacturing jumper (reserved for the manufacturer)
3 BIOS recovery jumper	

Attention: To set the jumpers, you need to open the server cover. Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

1 Clear CMOS /Recovery jumper

Used to clear CMOS and recover your server to the factory default settings.

Note: After clearing CMOS, all your BIOS passwords are erased and the BIOS recovers to the factory default settings.

To clear CMOS, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.

3. Lay the server on its side for easier operation.
4. Locate the Clear CMOS /Recovery jumper on the system board and then move the jumper from the default normal position (pin 1 and pin 2) to the short-circuited position (pin 2 and pin 3).
5. Wait more than 10 seconds and then move the Clear CMOS /Recovery jumper back to the normal position (pin 1 and pin 2).
6. Reinstall the server cover and connect the power cord(s). See “Completing the parts replacement” on page 162.
7. Wait about 30 seconds. Then, turn on the server. The BIOS passwords are erased and the BIOS recovers to the factory default settings.

2 BMC setting jumper

When the BMC setting jumper is in the default normal position (pin 1 and pin 2), the server needs about 30 seconds for the BMC to initialize whenever you connect the server to an ac power source. If you press the power switch on the front panel during this period, the server will not start immediately; it will start after the BMC initialization finishes.

If you move the BMC setting jumper to pin 2 and pin 3, the server will be directly turned on when you press the power switch without waiting for the BMC ready. The BMC function might not be available in this situation.

3 BIOS recovery jumper

Set the jumper and boot the server from a BIOS recovery image in order to recover your BIOS settings.

To recover the BIOS, see “Recovering from a BIOS update failure” on page 68.

4 Clear password jumper

Used to erase forgotten passwords, such as an administrator password and a user password.

To clear passwords, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the Clear password jumper on the system board and then move the jumper from the default normal position (pin 1 and pin 2) to the short-circuited position (pin 2 and pin 3).
5. Wait more than 10 seconds and then move the Clear password jumper back to the normal position (pin 1 and pin 2).
6. Reinstall the server cover and connect the power cord(s). See “Completing the parts replacement” on page 162.
7. Wait about 30 seconds. Then, turn on the server. The BIOS passwords are erased, including the administrator password and user password.
8. To set new passwords, see “Using passwords” on page 65.

5 Manufacturing jumper

Reserved for the manufacturer.

System board LEDs

This topic helps you locate the LEDs on the system board.

The following illustration shows the BMC status LED, system board hardware fault LED, and the POST code diagnostic LEDs on the system board.

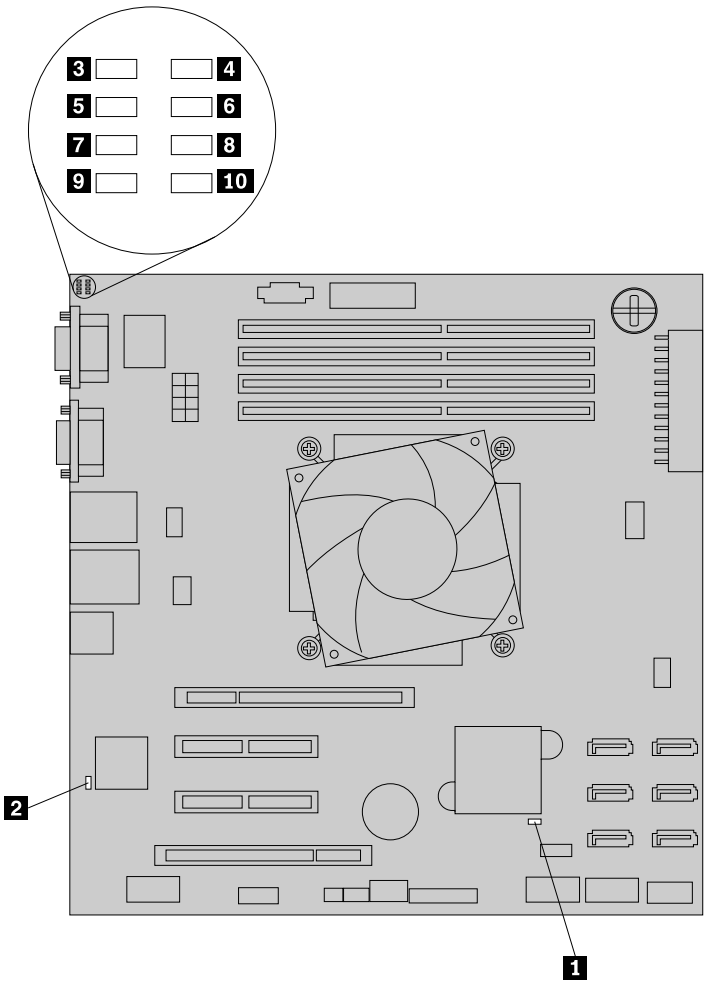


Figure 30. System board LEDs

1 System board hardware fault LED	6 POST code diagnostic LED #1
2 BMC status LED	7 POST code diagnostic LED #6
3 POST code diagnostic LED #4	8 POST code diagnostic LED #2
4 POST code diagnostic LED #0 - Least Significant Bit (LSB)	9 POST code diagnostic LED #7 - Most Significant Bit (MSB)
5 POST code diagnostic LED #5	10 POST code diagnostic LED #3

1 System board hardware fault LED

When this LED is lit, it indicates that the system board hardware has failed.

2 BMC status LED

This LED indicates the BMC status of your server.

BMC status LED	Color	Description
On	Green	The BMC is not ready.
Off	None	The BMC has no power or fails.
Blinking	Green	The BMC is working.

3 - 10 POST code diagnostic LEDs

During the system boot process, the BIOS executes several platform configuration processes, each of which is assigned a specific hex POST code number. When each configuration routine is started, the BIOS displays the POST code number through the POST code diagnostic LEDs on the system board. To assist in troubleshooting a system hang during the POST process, the diagnostic LEDs can be used to identify the last POST process executed.

The POST code diagnostic LED #0 (callout 4) is the LSB and the POST code diagnostic LED #7 (callout 9) is the MSB. If a POST code diagnostic LED is lit, it indicates 1 in the binary numeral system; otherwise, it indicates 0. For example, if POST code diagnostic LEDs 5, 6, 9, and 10 are lit, you can read the number as the following:

POST code diagnostic LED	9	7	5	3	10	8	6	4
Binary symbol	1	0	1	0	1	0	1	0

The “10101010” indicates a corresponding POST code. For detailed information about the POST code, refer to the *Hardware Maintenance Manual*. See “Server documentation” on page 2 for information about the *Hardware Maintenance Manual*.

Note: The POST code diagnostic LEDs and POST error code information are intended for trained service personnel of Lenovo.

Chapter 4. Turning on and turning off the server

This chapter provides information about turning on and turning off the server.

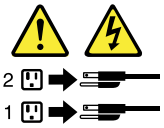
Turning on the server

The server can be turned on in one of the following ways:

- After you finish unpacking and setting up the server, connect it to an ac power source. Press the power switch on the front panel to turn on the server. See “Front panel” on page 17. The server needs about 30 seconds for the BMC to initialize whenever you connect the server to an ac power source. If you press the power switch on the front panel during this period, the server will not start immediately; it will start after the BMC initialization finishes.
- When the Wake on LAN feature is enabled on the server that is connected to an ac power source and a LAN, a network administrator can remotely turn on or wake up the server from a management console using remote network management software.
- You can also use the related BMC feature to remotely turn on the server through the management LAN.

Turning off the server

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



The server can be turned off in one of the following ways:

- Turn off the server from the operating system if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically. For instructions on how to shut down your specific operating system, refer to the related documentation or help system for the operating system.
- Press the power switch on the front panel to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If your server stops responding and you cannot turn it off, press and hold the power switch on the front panel for four seconds or more. If you still cannot turn off the server, disconnect all power cords from the server.
- If the server is connected to a LAN, a network administrator can remotely turn off the server from a management console using remote network management software.
- You can also use the related BMC feature to remotely turn off the server through the management LAN.
- The server might be turned off as an automatic response to a critical system failure.

Notes:

1. When you turn off the server and leave it connected to an ac power source, the server can also respond to a remote request to turn on the server. To remove all power from the server, you must disconnect the server from the ac power source.

2. For information about your specific operating system, refer to the related documentation or help system for the operating system.

Chapter 5. Configuring the server

This chapter provides the following information to help you configure the server:

- “Using the Setup Utility program” on page 55
- “Using the ThinkServer EasyStartup program” on page 69
- “Configuring RAID” on page 71
- “Configuring the Ethernet controllers” on page 81
- “Updating the firmware” on page 81

Using the Setup Utility program

This topic provides information about using the Setup Utility program.

The Setup Utility program is part of the server firmware. You can use the Setup Utility program to view and change the configuration settings of your server, regardless of which operating system you are using. However, the operating system settings might override any similar settings in the Setup Utility program.

Starting the Setup Utility program

This topic provides instructions on how to start the Setup Utility program.

To start the Setup Utility program, do the following:

1. Connect the server to an ac power source and press the power switch on the front panel to turn on the server. See “Turning on the server” on page 53.
2. Press the F1 key as soon as you see the logo screen. Then, wait for several seconds, and the Setup Utility program opens. If you have set a password, you need to type the correct password to enter the Setup Utility program. For password information, see “Using passwords” on page 65.

Viewing information in the Setup Utility program

The Setup Utility program menu lists various items about the system configuration. Select a desired item to view information or change settings.

When working with the Setup Utility program, you must use the keyboard. The keys used to perform various tasks are displayed on the right bottom pane of each screen. You can also press the F1 key for general help about the keys. For most items, the corresponding help message is displayed on the right top pane of the screen when the item is selected. If the item has submenus, you can display the submenus by pressing Enter.

You can view the following information about your specific server model from the Setup Utility program:

- The **Main** menu lists information about the BIOS version, microprocessor type and core frequency, memory size, and system date and time.
- On the **Advanced** menu:
  - Select **Processor Configuration** to view the information about the installed microprocessor and its supported technologies.
  - Select **Memory Configuration** to view the information about the installed memory modules.
  - Select **SATA Configuration**. Then, select the desired SATA port from **SATA Port0** to **SATA Port5** to view the information about the installed SATA devices, such as a SATA hard disk drive or an optical drive.

- On the **Server Management** menu, select **System Information** to view the information about your system, including the BMC information.

Setup Utility program interface

This topic provides information about the menus and items in the Setup Utility program.

Depending on the version of your system BIOS, some menu or item information might differ slightly from the information in this topic. The information in this topic is based on the 0.9b version of the BIOS.

Notes:

1. The default settings are already optimized for you. Use the default value for any item you are not familiar with. Do not change the value of unfamiliar items or items that are not mentioned in this topic to avoid unexpected problems. If you consider changing the server configuration, proceed with extreme caution. Setting the configuration incorrectly might cause unexpected results. If you cannot turn on the server because of incorrect BIOS settings, use the Clear CMOS /Recovery jumper to recover the BIOS to the factory default settings or use the BIOS recovery jumper to boot the server from a BIOS recovery image and recover the BIOS to the version in the image. See “System board jumpers” on page 46.
2. Lenovo provides the BIOS update utility on the Lenovo Support Web site. You can download the BIOS image and follow the instructions on the Web site to update the BIOS. See “Updating or recovering the BIOS” on page 67. After updating the BIOS, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs.
3. If you have changed any hardware in the server, you might need to reflash the BIOS, the BMC firmware, and the FRU/SDR.

The following menus are listed on the **BIOS Setup Utility** screen:

- **Main**: See “Main menu” on page 56.
- **Advanced**: See “Advanced menu” on page 57.
- **Security**: See “Security menu” on page 60.
- **Server Management**: See “Server Management menu” on page 61.
- **Boot Options**: See “Boot Options menu” on page 62.
- **Boot Manager**: See “Boot Manager menu” on page 64.
- **Exit**: “Exit menu” on page 64.

Main menu

After entering the Setup Utility program, you can see the **Main** menu, which lists some basic information about the system BIOS version and build date, the microprocessor, memory, and the system date and time.

The following illustration shows an example of the **Main** menu in the Setup Utility program.

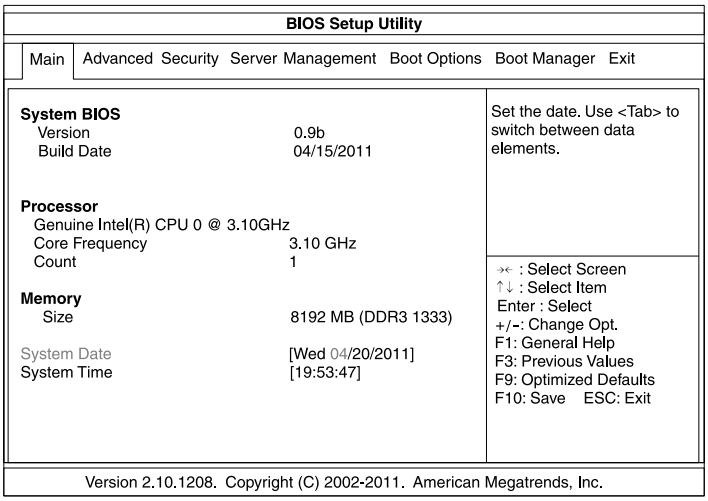


Figure 31. An example of the Main menu in the Setup Utility program

To set the system date and time on the **Main** menu, see "Setting the system date and time" on page 64.

Advanced menu

This topic provides information about the various configuration menus and items on the **Advanced** menu in the Setup Utility program.

You can view or change various server component settings on the **Advanced** menu. The following table shows the contents of the **Advanced** menu. On each submenu, press the Enter key to show selectable options and select a desired option by using up and down arrow keys or type desired values from the keyboard directly. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.
- Default values are in **boldface** in the **Selections** column.

Advanced menu items

Menu item	Submenu item	Selections	Comments
Processor Configuration (set the microprocessor configuration parameters)	Intel Hyper-Threading Technology	• Disabled • **Enabled**	Enable or disable the Intel Hyper-Threading Technology.
	Active Processor Cores	• **All** • 1 • 2 • 3	Set the active microprocessor cores.
	Intel Virtualization Technology	• Disabled • **Enabled**	Enable or disable the Intel Virtualization Technology.

Menu item	Submenu item	Selections	Comments
	Intel EIST Technology	• Disabled • **Enabled**	Enable or disable the Intel EIST Technology.
	P-State Coordination	• **HW_ALL** • SW_ALL • SW_ANY	Change the P-State Coordination type.
	Intel Turbo Boost Technology	• Disabled • **Enabled**	Enable or disable the Intel Turbo Boost Technology.
	C1E Support	• Disabled • **Enabled**	Enable or disable the C1E Support.
	CPU C3 Report	• Disabled • **ACPI C2** • ACPI C3	Enable or disable the CPU C3 report.
	CPU C6 Report	• **Disabled** • Enabled	Enable or disable the CPU C6 report.
	Package C State Limit	• C0 • C1 • C6 • C7 • **No Limit**	Set the Package C state limit.
	Hardware Prefetcher	• Disabled • **Enabled**	Enable or disable the hardware prefetcher function.
	Adjacent Cache Line Prefetch	• Disabled • **Enabled**	Enable or disable the adjacent cache line prefetcher function.
Memory Configuration (set memory configuration parameters and view information about the installed memory modules)	Memory Reset	• **No** • Yes	Set the memory module reset options. If a memory module encounters any errors, set this option to **Yes** to try to re-initialize the memory module.
Chipset Configuration (set chipset configuration parameters)	Intel VT-d Technology	• **Disabled** • Enabled	Enable or disable the Intel VT-d technology.
	Intel TXT Technology	• Disabled • **Enabled**	Enable or disable the Intel Trusted Execution Technology (TXT).
	Serial Port 1	• Disabled • **Enabled**	Enable or disable the serial port 1 (COM 1).
	Serial Port 2	• Disabled • **Enabled**	Enable or disable the serial port 2 (COM 2).
	Power on by RTC Alarm	• **Disabled** • Enabled	Enable or disable powering on by RTC alarm.
	Restore on AC Power Loss	• Stay off • **Last State**	Select the system resume status after ac power loss.

Menu item	Submenu item	Selections	Comments
		• Power on	If the power is interrupted when the server is on, after the power resumes: • If you have selected **Stay off**, the server will stay in the off state. • If you have selected **Last State**, the server will resume to the last state. • If you have selected **Power on**, the server will restart automatically.
SATA Configuration (set SATA configuration parameters)	SATA Mode	• **IDE Mode** • AHCI Mode • RAID Mode	Select SATA controller operation mode. If you want to configure RAID, choose **RAID Mode** for the SATA controller.
	SATA Port0		View the information about the SATA device connected to the SATA connector 0 on the system board.
	SATA Port1		View the information about the SATA device connected to the SATA connector 1 on the system board.
	SATA Port2		View the information about the SATA device connected to the SATA connector 2 on the system board.
	SATA Port3		View the information about the SATA device connected to the SATA connector 3 on the system board.
	SATA Port4		View the information about the SATA device connected to the SATA connector 4 on the system board.
	SATA Port5		View the information about the SATA device connected to the SATA connector 5 on the system board.
PCI Configuration (set PCI configuration parameters)	Onboard Graphics Controller	• Disabled • **Enabled**	Enable or disable the onboard graphics controller.
	Primary Graphics	• Onboard • **Add-On**	Choose a mode for primary graphics. The **Add-On** option requires a graphics card installed.
	Onboard LAN1 I/O ROM	• Disabled • **Enabled**	Enable or disable the onboard LAN1 I/O ROM.

Menu item	Submenu item	Selections	Comments
	Onboard LAN2 I/O ROM	• Disabled • **Enabled**	Enable or disable the onboard LAN2 I/O ROM.
	PCI ROM Priority	• **Legacy ROM** • EFI Compatible ROM	Choose a mode for the PCI ROM priority. In case of multiple Option ROMs (**Legacy ROM** and **EFI Compatible ROM**), the selection specifies which PCI Option ROM to launch.
USB Configuration (set USB configuration parameters)	USB Controller	• Disabled • **Enabled**	Enable or disable the USB controller.
	Legacy USB Support	• **Enabled** • Disabled • Auto	Enable or disable the support on legacy USB devices.
	Port 60/64 Emulation	• Disabled • **Enabled**	Enable or disable the port 60h/64h emulation. This function is for the operating system that does not support legacy USB devices.
	TANDBERGRDX 3040	• **Auto** • Floppy • Forced FDD • Hard Disk • CD-ROM	Mass storage device emulation type. **Auto** means to enumerate devices according to their media format. Optical devices are emulated as “CD-ROM”; drives with no media are emulated according to the drive type.
Console Redirection Configuration (set console redirection configuration parameters)	Console Redirection	• **Disabled** • Serial Port 1 • Serial Port 2	The setting specifies how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

Security menu

This topic provides information about the security related settings on the **Security** menu in the Setup Utility program.

You can set passwords, the TPM feature, and other security features on the **Security** menu. The following table shows the contents of the **Security** menu. For each menu item, press the Enter key to show selectable options and select a desired option by using up and down arrow keys or type desired values from the keyboard directly. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.
- Default values are in **boldface** in the **Selections** column.

Security menu items

Menu item	Selections	Comments
Set Administrator Password		Set an administrator password to protect against unauthorized access to your server. See “Using passwords” on page 65.
Set User Password		Set a user password to protect against unauthorized access to your server. See “Using passwords” on page 65. This item is only available after you have set an administrator password.
Power/Reset Button Lockout	• **Disabled** • Enabled	If this item is set to **Enabled**, the power switch on the front panel will be locked and the server can only be turned on remotely.
BIOS Write Protect	• **Disabled** • Enabled	If you want to update or flash the BIOS, make sure that this item is set to **Disabled**. If this item is set to **Enabled**, the BIOS will be protected from updating or flashing.
TPM Support	• Disabled • **Enabled**	Enable or disable the TPM support. To use the TPM feature, you need to have a TPM module installed in the TPM connector on the system board.
TPM State	• **Disabled** • Enabled	This item is displayed when the **TPM Support** is set to **Enabled**. Set the **TPM State** to enable or disable the TPM function. The server will restart in order to change the state of TPM.

Server Management menu

This topic provides information about the features available on the **Server Management** menu in the Setup Utility program.

You can view system information and view or change event log settings on the **Server Management** menu. The following table shows the contents of the **Server Management** menu. On each submenu, press the Enter key to view the information or show selectable options and select a desired option by using up and down arrow keys. Some items are displayed on the menu only if the server supports the corresponding features.

Note: Default values are in **boldface** in the **Selections** column.

Server Management menu items

Menu item	Submenu item	Selections	Comments
System Information			View the information about your system, including the BMC version information.
BMC LAN Configuration	Clear all Event Logs	• Enabled • **Disabled**	If this item is set to **Enabled**, the SEL will be cleared.
	Configuration Source	• Static • **Dynamic** • Do Nothing	Select to configure LAN channel1 parameters statically or dynamically (DHCP). The **Do Nothing** option means that BMC network parameters will not be modified during the BIOS phase.

Boot Options menu

This topic provides information about the menus and items on the **Boot Options** menu in the Setup Utility program.

The **Boot Options** menu provides an interface to help you view or change the server startup options, including the startup sequence and boot priority for various devices. Changes in the startup options take effect when you start the server.

The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. For example, you can define a startup sequence that checks for a disc in the optical drive, then checks the hard disk drive, and then checks a network device. For information about setting the startup sequence or selecting a startup device, see “Selecting a startup device” on page 66.

The following list, showing the order in which devices will be started up, is always displayed. Even devices that are not attached to or installed in your server are listed. For each device that is attached to or installed in the server, information about it is presented on the screen after the colon.

1. **UEFI Device:**
2. **Hard Disk Drive:**
3. **Optical Disk Drive:**
4. **Removable Device:**
5. **Network Device:**

The following table shows the contents of the **Boot Options** menu. On each submenu, press the Enter key to show selectable options and select a desired option by using up and down arrow keys. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.
- Default values are in **boldface** in the **Selections** column.

Boot Options menu items

Menu item	Selections	Comments
Boot Option #1	• **UEFI Device** • Hard Disk Drive • Optical Disk Drive • Removable Device • Network Device	Set the first startup device.
Boot Option #2	• UEFI Device • **Hard Disk Drive** • Optical Disk Drive • Removable Device • Network Device	Set the second startup device.
Boot Option #3	• UEFI Device • Hard Disk Drive • **Optical Disk Drive** • Removable Device • Network Device	Set the third startup device.
Boot Option #4	• UEFI Device • Hard Disk Drive • Optical Disk Drive • **Removable Device** • Network Device	Set the fourth startup device.
Boot Option #5	• UEFI Device • Hard Disk Drive • Optical Disk Drive • Removable Device • **Network Device**	Set the fifth startup device.
UEFI Boot Device Priority	Varies depending on the available UEFI devices.	Specify the startup priority for all the available UEFI devices.
Hard Disk Drive Priority	Varies depending on the available hard disk drives.	Specify the startup priority for all the available hard disk drives.
Optical Disk Drive Priority	Varies depending on the available optical drives.	Specify the startup priority for all the available optical drives.
Removable Device Priority	Varies depending on the available removable devices.	Specify the startup priority for all the available removable devices.
Network Device Priority	Varies depending on the available network devices.	Specify the startup priority for all the available network devices.
Quiet Boot	• Disabled • **Enabled**	Enable or disable the quiet boot feature to determine whether the logo screen will be displayed or not when starting the server.

Menu item	Selections	Comments
Bootup Num-Lock	• On • **Off**	Turn the Num-Lock key on or off.
POST Error Pause	• Disabled • **Enabled**	Enable or disable the POST error pause feature. When this feature is set to **Enabled**, the system will stop on the POST screen if any error occurs during the POST.

Boot Manager menu

This topic provides information about the **Boot Manager** menu in the Setup Utility program.

The **Boot Manager** menu lists all the bootable devices installed on your server system board and the items listed vary depending on your server configuration and installed option devices. If you select a desired device listed on this menu, the server will start from the device you select.

You can press F12 when turning on the server and select a temporary startup device directly from the boot device selection window. See “Selecting a startup device” on page 66.

Exit menu

This topic provides information about the **Exit** menu in the Setup Utility program.

After you finish viewing or changing settings in the Setup Utility program, you can choose one desired action from the **Exit** menu to save changes, discard changes, load default values, and exit the program. The following table lists each item on the **Exit** menu with descriptions. Press Enter to select the item and then select **Yes** when prompted to confirm the action. For information about exiting the Setup Utility program, see “Exiting the Setup Utility program” on page 67.

Exit menu items

Item	Comments
Save Changes and Exit	Save your settings and exit the Setup Utility program.
Discard Changes and Exit	Discard your settings and exit the Setup Utility program.
Save Changes	Save your settings.
Discard Changes	Discard your settings and load previous values.
Load Default Values	Return to the optimized default settings.
Save as User Default Values	Save the changes so far as user default values.
Load User Default Values	Restore the user default values for all the items.

Setting the system date and time

This topic provides instructions on how to set the system date and time in the Setup Utility program.

To set the system date and time in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. On the **Main** menu, select **System Date** or **System Time**.
3. Use the Tab key to switch between data elements and type the numbers from the keyboard to set the system date and time.
4. Press F10 to save settings and exit the Setup Utility program.

Using passwords

By using the Setup Utility program, you can set a password to prevent unauthorized access to your server.

You do not have to set a password to use your server. However, using a password improves computing security. If you decide to set a password, read the following topics.

Setup Utility program password type

The following types of passwords are available in the Setup Utility program:

- **Administrator password**

  Setting an administrator password deters unauthorized users from changing configuration settings. If you are responsible for maintaining the configuration settings of several computers, you might want to set an administrator password. When an administrator password is set, you are prompted to type a valid password each time you try to access the Setup Utility program. The Setup Utility program cannot be accessed until a valid password is typed in.
- **User password** (only available when you have set an administrator password)

  When a user password is set, the server cannot be used until a valid password is typed in.

Note: If both the administrator password and user password are set, you can type either password. However, you must use your administrator password to change any configuration settings.

Password considerations

For security reasons, it is recommended to use a strong password that cannot be easily compromised.

Notes:

1. The Setup Utility program passwords are not case sensitive.
2. The server supports Setup Utility program passwords that consist of up to 20 characters.

To set a strong password, use the following guidelines:

- Have at least eight characters in length
- Contain at least one alphabetic character and one numeric character
- Not be your name or your user name
- Not be a common word or a common name
- Be significantly different from your previous passwords

Besides the alphabetic characters (a-z) and numeric characters (0-9), the server also supports characters typed using special keys on the keyboard for a password. Refer to the help message on the screen when setting a password to determine the valid special characters.

Setting, changing, or deleting a password

This topic provides instructions on how to set, change, or delete a password in the Setup Utility program.

To set, change, or delete a password in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. On the **Security** menu, select **Set Administrator Password** to set an administrator password or select **Set User Password** to set a user password.

   Note: The **Set User Password** option is only available when you have already set an administrator password.

3. See “Password considerations” on page 65. Then, follow the instructions on the screen to set or change a password.
4. If you want to delete a password, type your current password. Press Enter when you are prompted to type a new password. Then, press Enter to confirm the new password. The previous password will be cleared.

   Note: If you delete an administrator password, the user password will also be deleted. For security reasons, it is recommended that you always set a password for your server.
5. Press F10 to save settings and exit the Setup Utility program.

If you have forgotten the password, you can use the Clear password jumper on the system board to erase the password. See “System board jumpers” on page 46. Then, set a new password for the server.

Configuring the TPM function

The TPM function provides a hardware security solution to encrypt data and protect the server. The TPM function is only available when there is a TPM module installed in your server. See “Installing the TPM module” on page 109. You can purchase a TPM module from Lenovo.

After installing a TPM module, you need to check if the TPM function is enabled in the Setup Utility program.

To enable the TPM function in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. On the **Security** menu, select **TPM Support**. Make sure that the **TPM Support** is set to **Enabled**.
3. When the **TPM Support** is set to **Enabled**, the **TPM State** item is displayed. Set the **TPM State** to **Enabled**.
4. Press F10 to save settings and exit the Setup Utility program. The server will restart in order to enable the TPM function.

Selecting a startup device

If your server does not start up from a desired device such as the disc or hard disk drive as expected, do one of the following to select the startup device you want:

Note: Not all discs, hard disk drives, or other removable devices are bootable.

- To select a temporary startup device, do the following:

  Note: Selecting a startup device using the following method does not permanently change the startup sequence.

  1. Turn on or restart your server.
  2. When you see the logo screen, press F12 to display the boot menu. The boot device selection window opens. If your server is connected to a network and you want to start up the server from the network, press F10.
  3. In the boot device selection window, use the up and down arrow keys on the keyboard to switch between the selections. Press Enter to select the device of your choice. Then, the server will start up from the selected device.
- To view or permanently change the configured startup device sequence, do the following:
  1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
  2. On the **Boot Options** menu, follow the instructions on the screen to set the startup device for **Boot Option #1** to **Boot Option #5** depending on your needs. You can also set the boot priority for various devices. See “Boot Options menu” on page 62.

3. Press F10 to save settings and exit the Setup Utility program. The server will follow the startup device sequence you have set each time you turn on the server.

Exiting the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program main interface. If you are on a nested submenu, press Esc repeatedly until you reach the main interface. Then, you can do one of the following:

- If you want to save the new settings and exit the Setup Utility program, press F10. Otherwise, your changes will not be saved.
- If you do not want to save the new settings, select **Exit → Discard Changes and Exit**.
- If you want to return to the default settings, press F9 or select **Exit → Load Default Values**.

For more information about the **Exit** menu in the Setup Utility program, see “Exit menu” on page 64.

Updating or recovering the BIOS

This topic provides instructions on how to update the BIOS and how to recover from a POST and BIOS update failure.

System programs are the basic layer of software built into your server. System programs include the POST, the UEFI BIOS, the Setup Utility program, and the BMC firmware. The POST is a set of tests and procedures that are performed each time you turn on your server. The UEFI BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the server hardware can execute. You can use the Setup Utility program to view or change the configuration settings of your server. See “Using the Setup Utility program” on page 55. The BMC firmware works together with an iKVM key to provide advanced server management features.

Your server system board has a module called electrically erasable programmable read-only memory (EEPROM, also referred to as flash memory). You can easily update the POST, the BIOS and BMC firmware, and the Setup Utility program by starting your server with a system-program-update disc or a bootable USB key.

Lenovo might make changes and enhancements to the BIOS and BMC firmware. When updates are released, they are available for download on the Lenovo Support Web site at http://www.lenovo.com/support. Instructions for using the updates are available in a TXT file that is included with the update files. You can download a self-starting disc image (known as an ISO image) for the update program and create a system-program-update disc or copy all files in the BIOS update package to a bootable USB key and start the server from the USB key.

You can also use the Firmware Updater program to help you keep the server firmware up-to-date. See “Updating the firmware” on page 81.

Downloading the BIOS update utility program

Before updating or recovering your BIOS, you need to download a BIOS update utility program from the Lenovo Support Web site.

To download the BIOS update utility program, do the following:

Note: Lenovo maintains the Support Web site by making changes and improvements periodically. The actual procedure might vary slightly from what is described in this topic.

1. Go to the Lenovo Support Web site at:
   http://www.lenovo.com/support

2. Click **Download & Drivers → ThinkServer**.
3. Find the product name and click the machine type of your server. To find the machine type information on the chassis, see “Machine type, model, and serial number label” on page 13.
4. Locate the **BIOS update utility** on the Web page and then click the version number of the BIOS update utility program. Follow the instructions on the Web page to download the ISO image or update package and the installation instructions in a TXT file.
5. If you will use an ISO image to update the BIOS, use any CD or DVD burning software to create a bootable disc with the ISO image. If you will use an update package to update the BIOS, extract the package to a local drive and copy all the files to a bootable USB key.
6. Print the TXT file that contains the installation instructions. You will need the instructions when performing the BIOS update or recovery procedure.

Updating (flashing) the BIOS

This topic provides instructions on how to update (flash) the BIOS.

Notes:

1. Update the BIOS on your server only if the newer BIOS version specifically solves a problem you have. We do not recommend BIOS updates for servers that do not need it. You can view the updated information for the new BIOS version in the installation instructions for the BIOS update utility program. See “Downloading the BIOS update utility program” on page 67.
2. Downgrading the BIOS to an earlier version is not recommended and might not be supported. An earlier BIOS version might not contain the support for the latest system configurations.
3. If the power to your server is interrupted while the POST and BIOS is being updated, your server might not restart correctly. Make sure that you perform the BIOS update procedure in an environment with a steady power supply. Besides, make sure that your server can restart successfully without encountering hardware problems.
4. If you have updated the BIOS firmware, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs. You can note down your specific BIOS settings before updating the BIOS for an easier reconfiguration in the new BIOS version.

To update (flash) the BIOS, do the following:

1. Download a BIOS update utility program and its installation instructions from the Lenovo Support Web site. Then, make a bootable disc or a bootable USB key and print the TXT file that contains the installation instructions. See “Downloading the BIOS update utility program” on page 67.
2. Turn on the server and press the F1 key as soon as you see the logo screen to start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
3. On the **Security** menu, check the **BIOS Write Protect** setting. To update (flash) the BIOS, the **BIOS Write Protect** item must be set to **Disabled**.
4. Press F10 to save settings and exit the Setup Utility program. Then, follow the installation instructions to update (flash) the BIOS using a disc or USB key.
5. The system will restart automatically after the update process is completed. Check and reconfigure the BIOS settings for your specific needs based on your note or refer to “Using the Setup Utility program” on page 55.

Recovering from a BIOS update failure

If the power to your server is interrupted while the BIOS is being updated, your server might not restart correctly. If this happens, perform the following procedure to recover from the BIOS update failure.

To recover from a BIOS update failure, do the following:

1. Download a BIOS update utility program and its installation instructions from the Lenovo Support Web site. Then, make a bootable disc or a bootable USB key and print the TXT file that contains the installation instructions. See “Downloading the BIOS update utility program” on page 67.
2. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
3. Remove the server cover. See “Removing the server cover” on page 85.
4. Locate the BIOS recovery jumper on the system board. See “System board jumpers” on page 46.
5. Remove any parts or disconnect any cables that might impede your access to the BIOS recovery jumper.
6. Move the BIOS recovery jumper from the normal position (pin 1 and pin 2) to the recovery position (pin 2 and pin 3).
7. Reinstall any parts or reconnect any cables and reinstall the server cover. See “Completing the parts replacement” on page 162.
8. Connect the server to an ac power source and then follow the installation instructions for the BIOS update utility program to start the server from the recovery image. The recovery window opens.
9. Press Enter to start the recovery process. After the recovery process is completed, your server will automatically turn off.
10. Repeat step 2 through step 5.
11. Move the BIOS recovery jumper back to the normal position (pin 1 and pin 2).
12. Reinstall any parts or reconnect any cables and reinstall the server cover. See “Completing the parts replacement” on page 162.
13. Connect the server to an ac power source and turn on the server. The BIOS settings become the default settings of the updated BIOS version. You need to check and configure the BIOS settings for your specific needs. See “Using the Setup Utility program” on page 55.

Using the ThinkServer EasyStartup program

This topic guides you to use the ThinkServer EasyStartup program to set up and configure your server.

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported Windows and Linux operating systems and device drivers on your server. The program works in conjunction with your Windows or Linux operating system installation disc to automate the process of installing the operating system and associated device drivers. This program is provided with your server on a self-starting (bootable) *ThinkServer EasyStartup* DVD. The user guide for the program is also on the DVD and can be accessed directly from the program interface.

If you do not have a *ThinkServer EasyStartup* DVD available, you can also download an ISO image from the Lenovo Support Web site and make a disc by yourself.

To download the ThinkServer EasyStartup program image and burn it into a disc, do the following:

Note: Lenovo maintains the Support Web site by making changes and improvements periodically. The actual procedure might vary slightly from what is described in this topic.

1. Go to the Lenovo Support Web site at:
   http://www.lenovo.com/support
2. Click **Download & Drivers → ThinkServer**.
3. Find the product name and click the machine type of your server. To find the machine type information on the chassis, see “Machine type, model, and serial number label” on page 13.
4. Click **EasySuite** to quickly locate the ThinkServer EasyStartup program on the Web page.

5. Click the version number of the ThinkServer EasyStartup program and then follow the instructions on the Web page to download the ISO image and installation instructions in a TXT file.

   Note: The Web page for downloading the ThinkServer EasyStartup program also contains detailed information about the program, including limitations and lists of hints and tips.
6. Use any DVD burning software to create a bootable disc with the ISO image.
7. Print the TXT file that contains the installation instructions and follow the instructions to start the ThinkServer EasyStartup program.

Features of the ThinkServer EasyStartup program

This topic lists the features of the ThinkServer EasyStartup program.

The ThinkServer EasyStartup program has the following features:

- Contained in a self-starting (bootable) DVD
- Easy-to-use, language-selectable interface
- Integrated help system and user guide
- Automatic hardware detection
- RAID configuration utility
- Device drivers provided based on the server model and detected devices
- Selectable partition size and file system type
- Support for multiple operating systems
- Ability to install the operating system and device drivers in an unattended mode to save time
- Ability to create a reuseable response file that can be used with similarly configured Lenovo servers to make future installations even faster

Starting the ThinkServer EasyStartup program

This topic provides instructions on how to start the ThinkServer EasyStartup program. After you start the program and enter the main interface, click **User Guide** for detailed information about how to use this program to help you configure the server and install an operating system.

To start the ThinkServer EasyStartup program, do the following:

1. Insert the *ThinkServer EasyStartup* DVD into the optical drive, set the optical drive as the first startup device, and start your server from the DVD in the optical drive. See “Selecting a startup device” on page 66.
2. Wait for the program to load. Then, you will be prompted for the following selections:
   - The language in which you want to view the program
   - The language of the keyboard layout you will be using with the program

   Note: The supported languages and keyboard layouts for the ThinkServer EasyStartup program are German, English, Spanish, French, Italian, Dutch, Turkish, and Japanese. Your *ThinkServer EasyStartup* DVD might be English only. In this case, the keyboard layout should be English.
3. After selecting the language and keyboard layout, click **OK**. Then, you will see one or more reminders or messages about configuring storage devices. Click **Next** until you are presented with the Lenovo License Agreement. Read the Lenovo License Agreement carefully. In order to continue, you must agree with terms by clicking **Agree**. Then, the Date and time window opens.
4. Set the current date and time and click **OK**. The Start option window opens.
5. The Start option window provides the following selections:

- Continue to the main interface.
- Install the operating system using a pre-existing response file.
- Configure RAID using a pre-existing response file.

Read the explanations on the screen and select a desired option. Then, follow the instructions on the screen. If this is the first time you are using the ThinkServer EasyStartup program, select the option to continue to the main interface and view the compatibility notes and user guide.

Notes:

1. Functionality and supported operating systems vary depending on the version of the ThinkServer EasyStartup program. From the main interface of the program, click **Compatibility notes** to view the information about the RAID controllers, operating systems, and server configurations supported by the specific version of the program and click **User Guide** to view the various functions and learn how to use the program.
2. Before using the ThinkServer EasyStartup program to install an operating system, make sure any external storage devices and fiber channels are configured correctly.

The ThinkServer EasyStartup program main interface provides the following menus on the left pane of the screen:

- **Home**

  This menu is the welcome page that contains some general descriptions about the program and the Lenovo copyright and trademark statements.

- **Compatibility notes**

  This menu provides information about the RAID controllers, operating systems, and server configurations supported by the version of the program you are using.

- **User Guide**

  This menu provides information about the features of the program and instructions on how to use the program.

- **Hardware list**

  This menu displays a list of hardware devices detected by the program.

- **Configure RAID**

  This menu guides you to configure RAID or view the current RAID configuration and make changes if needed.

- **Install operating system**

  This menu displays a series of choices and prompts to collect information required for operating system installation, prepares the hard disk drive for installation, and then initiates the installation process using your operating system installation disc.

- **About**

  This menu provides the version information and legal notices.

Configuring RAID

This topic provides information about RAID and the utility programs that are available for you to configure RAID.

This topic contains the following items:

- “About RAID” on page 72
- “RAID for your server” on page 73

- “Configuring RAID using the ThinkServer EasyStartup program” on page 74
- “Configuring the onboard SATA software RAID” on page 75
- “Configuring the advanced SATA or SAS hardware RAID” on page 80

About RAID

RAID, an acronym for Redundant Array of Independent Disks, is a technology that provides increased storage functions and reliability through redundancy. This is achieved by combining multiple hard disk drives into a logical unit, where data is distributed across the drives in one of several ways called RAID levels.

When a group of independent physical hard disk drives are set up to use RAID technology, they are in a RAID array. This array distributes data across multiple hard disk drives, but the array appears to the host server as one single storage unit. Creating and using RAID arrays provides high performance, such as the expedited I/O performance, because several drives can be accessed simultaneously.

RAID drive groups also improve data storage reliability and fault tolerance compared to single-drive storage systems. Data loss resulting from a drive failure can be prevented by reconstructing missing data from the remaining drives.

The following list describes some of the most commonly used RAID levels:

- **RAID 0**: block-level striping without parity or mirroring

  Simple stripe sets are normally referred to as RAID 0. RAID 0 uses striping to provide high data throughput, especially for large files in an environment that does not require fault tolerance. RAID 0 has no redundancy and it provides improved performance and additional storage without fault tolerance. Any drive failure destroys the array and the likelihood of failure increases with more drives in the array. RAID 0 does not implement error checking, so any error is uncorrectable. More drives in the array means higher bandwidth, but greater risk of data loss.

  RAID 0 requires a minimum number of two hard disk drives.

- **RAID 1**: mirroring without parity or striping

  RAID 1 uses mirroring so that data written to one drive is simultaneously written to another drive. This is good for small databases or other applications that require small capacity but complete data redundancy. RAID 1 provides fault tolerance from disk errors or failures and continues to operate as long as at least one drive in the mirrored set is functioning. With appropriate operating system support, there can be increased read performance and only a minimal write performance reduction.

  RAID 1 requires a minimum number of two hard disk drives.

- **RAID 5**: block-level striping with distributed parity

  RAID 5 uses disk striping and parity data across all drives (distributed parity) to provide high data throughput, especially for small random access. RAID 5 distributes parity along with the data and requires all drives but one to be present to operate; drive failure requires replacement, but the array is not destroyed by a single drive failure. Upon drive failure, any subsequent read operations can be calculated from the distributed parity so that the drive failure is masked from the end user. The array will have data loss in the event of a second drive failure and is vulnerable until the data that was on the failing drive is rebuilt onto a replacement drive. A single drive failure in the set will result in reduced performance of the entire set until the failing drive has been replaced and rebuilt.

  RAID 5 requires a minimum number of three hard disk drives.

- **RAID 10**: a combination of RAID 0 and RAID 1

  RAID 10 consists of striped data across mirrored spans. A RAID 10 drive group is a spanned drive group that creates a striped set from a series of mirrored drives. RAID 10 allows a maximum of eight spans. You must use an even number of drives in each RAID virtual drive in the span. The RAID 1 virtual drives must have the same stripe size. RAID 10 provides high data throughput and complete data redundancy but uses a larger number of spans.

  RAID 10 requires a minimum number of four hard disk drives and also requires an even number of drives, for example, six hard disk drives or eight hard disk drives.

- **RAID 50**: a combination of RAID 0 and RAID 5

  RAID 50 uses distributed parity and disk striping. A RAID 50 drive group is a spanned drive group in which data is striped across multiple RAID 5 drive groups. RAID 50 works best with data that requires high reliability, high request rates, high data transfers, and medium-to-large capacity.

  Note: Having virtual drives of different RAID levels, such as RAID 0 and RAID 5, in the same drive group is not allowed. For example, if an existing RAID 5 virtual drive is created out of partial space in an array, the next virtual drive in the array has to be RAID 5 only.

  RAID 50 requires a minimum number of six hard disk drives.

For detailed information about RAID, refer to “Introduction to RAID” in the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server.

RAID for your server

This topic provides information about the RAID supported by your server.

Your server supports the following two types of RAID configurations:

- **Onboard SATA software RAID configuration using the LSI Software RAID Configuration Utility program; and RAID management using the MegaRAID Storage Manager program**

  The onboard SATA software RAID controller is integrated in the Intel C202 chip on the system board. If your server has SATA hard disk drives that are connected to the system board, you can use the LSI Software RAID Configuration Utility program to configure RAID. Your server supports onboard SATA software RAID levels 0, 1, and 10. You can also activate RAID level 5 by installing a ThinkServer SATA Software RAID 5 activation key. See “Installing or removing the ThinkServer SATA Software RAID 5 Key” on page 102.

  You can install and use the MegaRAID Storage Manager program to manage the RAID array and RAID controller in an operating system environment.

  For detailed information, see “Configuring the onboard SATA software RAID” on page 75.

- **Advanced SATA/SAS hardware RAID configuration using the WebBIOS Configuration Utility program; and RAID management using the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program (requires a RAID card)**

  Some server models come with a required RAID card to provide advanced SATA/SAS hardware RAID functions to the server. You can also purchase the RAID card from Lenovo and install it into server models that support the RAID card to get advanced SATA/SAS hardware RAID functions. See "RAID card" on page 33 and "Installing or removing the RAID card" on page 98 for more information.

  Note: For server models with more than four hard disk drives or models that use SAS hard disk drives, there must be a RAID card installed.

  The RAID card provides the WebBIOS Configuration Utility program to help you configure RAID independently of the operating system. You can also install the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program to help you manage the RAID array and RAID controller in an operating system environment. The supported RAID levels are RAID 0, 1, and 10. To activate RAID 5 and 50 levels, you need to install a RAID 5 key on the RAID card. See "Installing or removing the ThinkServer 9240-8i RAID 5 Upgrade Key" on page 100.

  For detailed information, see "Configuring the advanced SATA or SAS hardware RAID" on page 80.

Note: The ThinkServer EasyStartup program simplifies the process of configuring supported RAID and installing supported operating systems and device drivers.

Before configuring RAID for your server, observe the following precautions:

1. Use hard disk drives that have the same capacity within a single RAID array.
2. Use hard disk drives that are of the same type (SATA or SAS) within a single RAID array.
3. Depending on the operating system, the primary RAID might be limited to 2 TB total drive capacity.

Configuring RAID using the ThinkServer EasyStartup program

The ThinkServer EasyStartup program simplifies the process of configuring supported RAID and installing supported Windows and Linux operating systems and device drivers on your server. The user guide for the program can be accessed directly from the program interface.

The ThinkServer EasyStartup program has the following features for RAID configuration:

- For use with all supported RAID controllers
- Automatically detects hardware and lists all supported RAID configurations
- Configures one or more disk arrays per controller depending on the number of drives attached to the controller and the RAID level selected
- Supports hot-spare drives
- Creates a RAID response file that can be used to configure RAID controllers on similarly configured Lenovo servers

See "Using the ThinkServer EasyStartup program" on page 69 and view the user guide from the main interface of the program.

Some RAID management software is also provided on the *ThinkServer EasyStartup* DVD to help you manage RAID arrays and RAID controllers in an operating system environment. After you enter the operating system, insert the *ThinkServer EasyStartup* DVD into the optical drive. The installation packages for the programs are located in the Utilities and Others folder in the root directory of the DVD. The *ThinkServer EasyStartup* DVD is designed for different types of servers and the Utilities and Others folder might contain additional installation packages that are not required to be installed into your server. For more information, see "Installing and using the MegaRAID Storage Manager program" on page 80 and "Configuring the advanced SATA or SAS hardware RAID" on page 80.

Configuring the onboard SATA software RAID

The onboard SATA software RAID controller is integrated in the Intel C202 chip on the system board. If your server has SATA hard disk drives that are connected to the system board, you can use the LSI Software RAID Configuration Utility program to configure RAID independently of the operating system. Your server supports onboard SATA software RAID levels 0, 1, and 10. You can also activate RAID 5 by installing a ThinkServer SATA Software RAID 5 activation key. See “Installing or removing the ThinkServer SATA Software RAID 5 Key” on page 102.

You can install and use the MegaRAID Storage Manager program to manage the RAID array and RAID controller in an operating system environment.

Starting the LSI Software RAID Configuration Utility program

This topic provides instructions on how to start the LSI Software RAID Configuration Utility program.

To start the LSI Software RAID Configuration Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. On the **Advanced** menu, select **SATA Configuration → SATA Mode**.
3. Select **RAID Mode**. Then, press F10 to save settings and exit the Setup Utility program.
4. When you see the message “Press Ctrl-M or Enter to run LSI Software RAID Setup Utility,” immediately press Ctrl+M or Enter to start the LSI Software RAID Configuration Utility program.

LSI Software RAID Configuration Utility program interface

This topic provides information about the menus and items in the LSI Software RAID Configuration Utility program. Depending on the version of the program, some menu or item information might differ slightly from the information in this topic.

When working with the LSI Software RAID Configuration Utility program, you must use the keyboard. The keys used to perform various tasks are displayed on the bottom of each screen. Use up and down arrow keys to navigate between items. For most items, the corresponding help message is displayed on the bottom of the screen when the item is selected. If the item has submenus, you can display the submenus by pressing Enter.

After entering the LSI Software RAID Configuration Utility program, you can see the **Management Menu** on the screen. The **Management Menu** contains the following menu items:

- **Configure**

  This menu contains items to help you create a RAID array, view the current RAID configuration, add a new array, delete an existing array, or select a boot virtual drive.

- **Initialize**

  This menu helps you initialize virtual drive(s).

  Note: Initializing a virtual drive erases all data on the virtual drive. Back up any data you want to keep and ensure the operating system is not installed on the virtual drive before the initialization.

- **Objects**

  This menu helps you configure parameters for the RAID adapter or controller, the virtual drive(s), and the physical drive(s).

- **Rebuild**

  This menu helps you rebuild a physical drive in an array in the event of a physical drive failure. You can choose to rebuild the data on the failing drive if the drive is still operational. If the drive is not operational, it must be replaced and the data on the failing drive must be rebuilt on a new drive to restore the system to fault tolerance. If hot-spare drives are available, the failing drive might be rebuilt automatically without any user intervention.

- **Check Consistency**

  This menu helps you do consistency check for the virtual drive(s). The consistency check verifies the correctness of the data on virtual drive(s) that use RAID 1, 5, and 10.

The following table shows the various menus and items in the LSI Software RAID Configuration Utility program. On each menu, press the Enter key to show selectable options and select a desired option by using up and down arrow keys or type desired values from the keyboard directly.

Menu item	Submenu item	Comments
Configure	**Easy Configuration**	Create physical arrays. An array will automatically become a virtual drive.
	New Configuration	Clear the existing configuration and start a new configuration.
	View/Add Configuration	View the existing configuration or add a new configuration.
	Clear Configuration	Clear the existing configuration.
	Select Boot Drive	Select a boot virtual drive.
Initialize	Varies by configuration.	Initialize virtual drives.
Objects	**Adapter**	Set adapter related parameters, such as rebuild rate, consistency check rate, auto-rebuild, and so on.
	Virtual Drive	Set virtual drive parameters.
	Physical Drive	Set physical drive parameters, such as creating a hot-spare drive for the virtual drive, making a failing drive as online, changing a drive state, and viewing the specifications of a physical drive.
Rebuild	Varies by configuration.	Rebuild physical drive(s).
Check Consistency	Varies by configuration.	Check consistency of virtual drive(s).

Creating, adding, or deleting a RAID array

This topic provides instructions on how to create, add, or delete a RAID array using the LSI Software RAID Configuration Utility program.

Note: Before you create a RAID array using the LSI Software RAID Configuration Utility program, make sure that the server meets the required hardware configuration. For example, the server needs to have the required number of SATA hard disk drives installed and connected to the system board. See “About RAID” on page 72 for information about the required number of hard disk drives for each RAID level. If you want to create a RAID 5 array using the LSI Software RAID Configuration Utility program, the server also needs to have a ThinkServer SATA Software RAID 5 Key installed on the system board. See “Installing or removing the ThinkServer SATA Software RAID 5 Key” on page 102.

To create, add, or delete a RAID array using the LSI Software RAID Configuration Utility program, do the following:

1. Start the LSI Software RAID Configuration Utility program. See “Starting the LSI Software RAID Configuration Utility program” on page 75.
2. On the main interface of the program, do one of the following depending on your needs:
   - If you want to create a RAID array, select **Easy Configuration** and then follow the instructions on the screen.
   - If you want to add a secondary RAID configuration, select **View/Add Configuration** and then follow the instructions on the screen to view the current configuration and add a new configuration.
   - If you want to delete the existing RAID configuration, exit the program and back up all your data on the hard disk drives. After backing up all your data, enter the program main interface and select **Clear Configuration**. Select **Yes** when prompted and follow the instructions on the screen.

     Attention: Deleting the existing RAID configuration erases all data on the virtual drive. Make sure that you back up all data before deleting the RAID array. If the operating system is installed on the virtual drive you want to delete, you need to reinstall the operating system after completing the operation.
   - If you want to delete the existing RAID configuration and make a new configuration, exit the program and back up all your data on the hard disk drives. After backing up all your data, enter the program main interface and select **New Configuration**. Select **Yes** when prompted to proceed and then follow the instructions on the screen.

     Attention: Deleting the existing RAID configuration erases all data on the virtual drive. Make sure that you back up all data before deleting the RAID array. If the operating system is installed on the virtual drive you want to delete, you need to reinstall the operating system after completing the operation.

Initializing a virtual drive

This topic provides instructions on how to initialize a virtual drive using the LSI Software RAID Configuration Utility program after completing the configuration process.

Virtual drive initialization is the process of writing zeros to the data fields of a virtual drive and, in fault-tolerant RAID levels, generating the corresponding parity to put the virtual drive in a ready state. Initialization erases all data on the virtual drive. Drive groups will work without being initialized, but they can fail a consistency check because the parity fields have not been generated.

Notes:

1. Make sure that you back up any data you want to keep before initializing a virtual drive.
2. Make sure that the operating system is not installed on the virtual drive you are initializing. Otherwise, you need to reinstall the operating system after completing the operation.

To initialize a virtual drive using the LSI Software RAID Configuration Utility program, do the following:

1. Start the LSI Software RAID Configuration Utility program. See “Starting the LSI Software RAID Configuration Utility program” on page 75.
2. On the main interface of the program, select **Initialize** and follow the instructions on the screen.

Setting a hot-spare drive

This topic provides instructions on how to set a physical drive as a hot-spare drive using the LSI Software RAID Configuration Utility program.

A hot-spare drive is an extra, unused drive that is part of the disk subsystem. It is usually in standby mode and ready for service if a drive fails. Setting hot-spare drives enables you to replace failing drives without performing a system shutdown operation. For a detailed introduction to hot-spare drives, refer to “Introduction to RAID” in the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server.

To set a physical drive as a hot-spare drive using the LSI Software RAID Configuration Utility program, do the following:

1. Start the LSI Software RAID Configuration Utility program. See “Starting the LSI Software RAID Configuration Utility program” on page 75.
2. Do one of the following:
   - If you want to create or add a new RAID array, you can set a hot-spare drive during the configuration process by following the instructions on the screen.
   - If you want to set a hot-spare drive right after the configuration, select **Objects → Physical Drive** from the program main interface. Then, select the physical drive that you want to set as a hot-spare drive and press Enter. A submenu is displayed. Select **Make Hot Spare** from the submenu and then select **Yes** when prompted to set the physical drive as a hot-spare drive.

Rebuilding a physical drive

This topic provides instructions on how to rebuild a physical drive using the LSI Software RAID Configuration Utility program when a physical drive in an array fails.

When a drive in a RAID drive group fails, you can rebuild the drive by recreating the data that was stored on the drive before it fails. If the drive is not operational, it must be replaced and the data on the failing drive must be rebuilt on a new drive to restore the system to fault tolerance. If hot-spare drives are available, the failing drive might be rebuilt automatically without any user intervention.

The RAID controller recreates the data using the data stored on other drives in the drive group. Rebuilding can be done only in drive groups with data redundancy, such as RAID 1, 5, and 10 drive groups. For a detailed introduction to disk rebuild, refer to “Introduction to RAID” in the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server.

To rebuild a physical drive using the LSI Software RAID Configuration Utility program when a physical drive in an array fails, do the following:

1. Start the LSI Software RAID Configuration Utility program. See “Starting the LSI Software RAID Configuration Utility program” on page 75.
2. On the main interface of the program, select **Rebuild** and follow the instructions on the screen.

Note: Running a consistency check immediately after the rebuild completes to ensure data integrity for the virtual drives. See “Running a consistency check” on page 79.

The rebuild rate is the percentage of the computing cycles dedicated to rebuilding failing drives. A rebuild rate of 100 percent means that the system gives priority to rebuilding the failing drives. The rebuild rate can

be configured between 0 percent and 100 percent. At 0 percent, the rebuild is done only if the system is not doing anything else. At 100 percent, the rebuild has a higher priority than any other system activity.

To configure the rebuild rate using the LSI Software RAID Configuration Utility program, do the following:

Note: Using a rebuild rate of 0 or 100 percent is not recommended. The default value is 30 percent.

1. Start the LSI Software RAID Configuration Utility program. See “Starting the LSI Software RAID Configuration Utility program” on page 75.
2. On the main interface of the program, select **Objects → Adapter → Rebuild Rate**.

   Note: Use up and down arrow keys to navigate between items and press Enter to select an option.
3. Set the rebuild rate by typing a desired value from the keyboard directly.

Running a consistency check

This topic provides instructions on how to run a consistency check for virtual drives using the LSI Software RAID Configuration Utility program.

A consistency check is an operation that verifies that all stripes on a virtual drive with a redundant RAID level are consistent. The consistency check operation verifies correctness of the data on virtual drives that use RAID 1, 5, and 10 (RAID 0 does not provide data redundancy). For example, in a system with parity, checking consistency means computing the data on one drive and comparing the results to the contents of the parity drive.

You should run a consistency check on fault-tolerant virtual drives periodically. It is recommended that you run a consistency check at least once a month. You must run a consistency check if you suspect that the virtual drive data might be corrupted. Be sure to back up the data before running a consistency check if you suspect the data might be corrupted.

To run a consistency check using the LSI Software RAID Configuration Utility program, do the following:

1. Start the LSI Software RAID Configuration Utility program. See “Starting the LSI Software RAID Configuration Utility program” on page 75.
2. On the main interface of the program, select **Check Consistency** and follow the instructions on the screen.

The consistency check rate is the rate at which consistency check operations are run on a system. The consistency check rate can be configured between 0 percent and 100 percent. At 0 percent, the consistency check is done only if the system is not doing anything else. At 100 percent, the consistency check has a higher priority than any other system activity.

To configure the consistency check rate using the LSI Software RAID Configuration Utility program, do the following:

Note: Using a consistency check rate of 0 or 100 percent is not recommended. The default value is 30 percent.

1. Start the LSI Software RAID Configuration Utility program. See “Starting the LSI Software RAID Configuration Utility program” on page 75.
2. On the main interface of the program, select **Objects → Adapter → Chk Const Rate**.

   Note: Use up and down arrow keys to navigate between items and press Enter to select an option.
3. Set the consistency check rate by typing a desired value from the keyboard directly.

Installing and using the MegaRAID Storage Manager program

You can install and use the MegaRAID Storage Manager program to manage the RAID array and RAID controller in an operating system environment after configuring RAID.

The installation package for the MegaRAID Storage Manager program is on the *ThinkServer EasyStartup* DVD. After you enter the operating system, insert the *ThinkServer EasyStartup* DVD into the optical drive. The installation package for the MegaRAID Storage Manager program is located in the Utilities and Others folder in the root directory of the DVD.

To install and use the MegaRAID Storage Manager program, refer to the following chapters in the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server:

Note: Some information in these chapters might be intended for the advanced SATA/SAS hardware RAID configurations and might not apply to the onboard SATA software configurations.

- "MegaRAID Storage Manager Overview and Installation"
- "MegaRAID Storage Manager Window and Menus"
- "Monitoring System Events and Storage Devices"
- "Maintaining and Managing Storage Configurations"

The *MegaRAID SAS Software User Guide* is also available on the Lenovo Web site at:
http://www.lenovo.com/ThinkServerUserGuides

Configuring the advanced SATA or SAS hardware RAID

Some server models come with a required RAID card to provide advanced SATA/SAS hardware RAID functions to the server. You can also purchase the RAID card from Lenovo and install it into server models that support the RAID card to get advanced SATA/SAS hardware RAID functions. See "RAID card" on page 33 and "Installing or removing the RAID card" on page 98 for more information.

Note: For server models with more than four hard disk drives or models that use SAS hard disk drives, there must be a RAID card installed.

The RAID card provides the WebBIOS Configuration Utility program to help you configure RAID independently of the operating system. You can also install the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program to help you manage the RAID array and RAID controller in an operating system environment. The supported RAID levels are RAID 0, 1, and 10. To activate RAID 5 and 50 levels, you need to install a RAID 5 key on the RAID card. See "Installing or removing the ThinkServer 9240-8i RAID 5 Upgrade Key" on page 100.

The installation packages for the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program are on the *ThinkServer EasyStartup* DVD. After you enter the operating system, insert the *ThinkServer EasyStartup* DVD into the optical drive. The installation packages for the programs are located in the Utilities and Others folder in the root directory of the DVD.

Note: The *ThinkServer EasyStartup* DVD is designed for different types of servers and the Utilities and Others folder might contain additional installation packages that are not required to be installed into your server.

For instructions on how to configure and manage the advanced SATA or SAS hardware RAID, refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server. This document is also available on the Lenovo Web site at:
http://www.lenovo.com/ThinkServerUserGuides

Configuring the Ethernet controllers

The Ethernet controllers are integrated on the system board. They provide an interface for connecting to a 10 Mbps, 100 Mbps, or 1000 Mbps network and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network.

You do not have to set any jumpers or configure the Ethernet controllers. However, you must install a device driver to enable the operating system to address the controllers.

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported operating systems and device drivers on your server. See “Using the ThinkServer EasyStartup program” on page 69.

The device drivers for onboard Ethernet controllers are also available for download at http://www.lenovo.com/support. To download the drivers, click **Download & Drivers → ThinkServer** and then follow the instructions on the Web page.

Updating the firmware

The firmware in the server is periodically updated and is available for download on the Lenovo Support Web site.

Go to http://www.lenovo.com/support, click **Download & Drivers → ThinkServer** and then follow the instructions on the Web page to check for the latest level of firmware, such as the BIOS and BMC updates and device drivers.

When you replace a device in the server, you might have to either update the server with the latest version of the firmware that is stored in memory on the device or reflash the BIOS, the BMC firmware, and the FRU/SDR from a disc image.

Using the Firmware Updater program

The Firmware Updater program enables you to maintain your system firmware up-to-date and helps you avoid unnecessary outages.

To update your system firmware using the Firmware Updater program, do the following:

Note: Lenovo maintains the Support Web site by making changes and improvements periodically. The actual procedure might vary slightly from what is described in this topic.

1. Go to the Lenovo Support Web site at:
   http://www.lenovo.com/support
2. Click **Download & Drivers → ThinkServer**.
3. Find the product name and click the machine type of your server. To find the machine type information on the chassis, see “Machine type, model, and serial number label” on page 13.
4. Click **EasySuite** to quickly locate the Firmware Updater program on the Web page.
5. Click the version number of the Firmware Updater program and then follow the instructions on the Web page to download the ISO image and installation instructions in a TXT file. The Web page for downloading the Firmware Updater program also contains information about the program limitations.
6. Use any CD or DVD burning software to create a bootable disc with the ISO image.
7. Print the TXT file that contains the installation instructions and follow the instructions to use the Firmware Updater program to update your system firmware.

Notes:

1. Before distributing the firmware updates to a server, ensure that your server can restart successfully without encountering hardware problems.
2. If you have updated the BIOS firmware, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs.

Chapter 6. Installing, removing, or replacing hardware

This chapter provides instructions on how to install, remove, or replace hardware for your server.

This chapter contains the following items:

- "Guidelines" on page 83
- "Removing the server cover" on page 85
- "Removing and reinstalling the front bezel" on page 87
- "Installing, removing, or replacing hardware" on page 89
- "Completing the parts replacement" on page 162

For a list of the ThinkServer options, go to http://www.lenovo.com/thinkserver. Click the **Products** tab and then click **Options** to view the supported server option information.

Guidelines

This topic provides some guidelines that you should read and understand before using your server.

Precautions

Before you use the server, be sure to read and understand the following precautions:

- Before using the product, be sure to read and understand the multilingual safety instructions and the Lenovo Limited Warranty (LLW) on the documentation DVD that comes with the product. Reading and understanding the safety instructions reduces the risk of personal injury and damage to your product.
- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, do the following:
  1. Go to http://www.lenovo.com/support.
  2. Click **Download & Drivers → ThinkServer** and then follow the instructions on the Web page to download firmware updates for your server.

  See "Updating the firmware" on page 81 for more information.
- Before you install optional hardware devices, make sure that the server is working correctly. If the server is not working correctly, see Chapter 7 "Troubleshooting and diagnostics" on page 167 to do basic troubleshooting. If the problem cannot be solved, see Chapter 8 "Getting information, help, and service" on page 175.
- Observe good housekeeping in the area where you are working. Put removed covers and other parts in a safe place.
- If you must turn on the server while the server cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.

- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the server to install or replace a hot-swap redundant power supply module, hot-swap hard disk drives, or hot-plug USB devices. However, you must turn off the server before performing any steps that involve installing, removing, or replacing adapter cables or non-hot-swap devices or components.
- To view the LEDs on the system board and internal components, leave the server connected to power.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- When working inside the server, you might find some tasks easier if you lay the server on its side.

Handling static-sensitive devices

Attention: Do not open the static-protective package that contains the new part until the defective part has been removed from the server and you are ready to install the new part. Static electricity, although harmless to you, can seriously damage server components and parts.

When you handle server parts and components, take these precautions to avoid static-electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic discharge (ESD) wrist strap, if one is available. Make sure that you work in an ESD-safe area.
- Always carefully handle the parts and other components (such as PCI cards, memory modules, system boards, and microprocessors) by its edges or its frame. Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- Before you replace a new part, touch the static-protective package containing the new part to an unpainted metal part of the server for at least two seconds. This reduces static electricity from the package and your body.
- Remove the new part from the static-protective package and directly install it in the server without placing it on any other surface. If it is hard for you to do this in your specific situation, place the static-protective package of the new part on a smooth, level surface, and then place the new part on the static-protective package.
- Do not place the part on the server cover or other metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that you follow these guidelines:

- Each of the drive bays has a drive or a dummy tray installed; or there is an electromagnetic interface (EMI) protective panel or EMI shield installed to protect the drive cage.
- If the server has redundant power, each of the power supply module bay has a redundant power supply module installed, or one bay has a module while the other bay is covered by a shield.
- Leave adequate space around the server to make sure that the server cooling system works well. Leave approximately 50 mm (2 inches) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, install the server cover before you turn on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.

- Properly route the cables. For some options, such as PCI cards, follow the cabling instructions that come with the options in addition to the instructions in this manual.
- Make sure that you replace a failing fan within 48 hours.
- When replacing a hot-swap drive, install the new hot-swap drive within two minutes of removal.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is turned on might cause the server to halt, which might result in the loss of data. To avoid this potential problem, always use an ESD wrist strap or other grounding system when you work inside the server with the power on.

The server supports hot-swap devices and is designed to operate safely while it is turned on and the cover is removed. Follow these guidelines when you work inside the server with the power on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils. These items might fall into the server as you lean over it.
- Avoid dropping any metallic objects into the server, such as paper clips, hairpins, and screws.

Removing the server cover

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove the server cover.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To remove the server cover, do the following:

1. Remove all media from the drives. Then, turn off all attached devices and the server.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cord(s), Input/Output (I/O) cables, and all other cables that are connected to the server.
4. Remove any locking device that secures the server cover, such as a padlock or an integrated cable lock. See “Server locks” on page 22.

5. Loosen the thumbscrew that secures the server cover and then slide the server cover to the rear until it is stopped.

   Notes:

   a. The server cover is securely installed and you need to use a tool, such as a screwdriver, to loosen the thumbscrew that secures the server cover. The thumbscrew is an integrated part of the server cover and do not try to remove the thumbscrew from the server cover.

   b. It is recommended that you wait three to five minutes to let the server cool before removing the server cover.

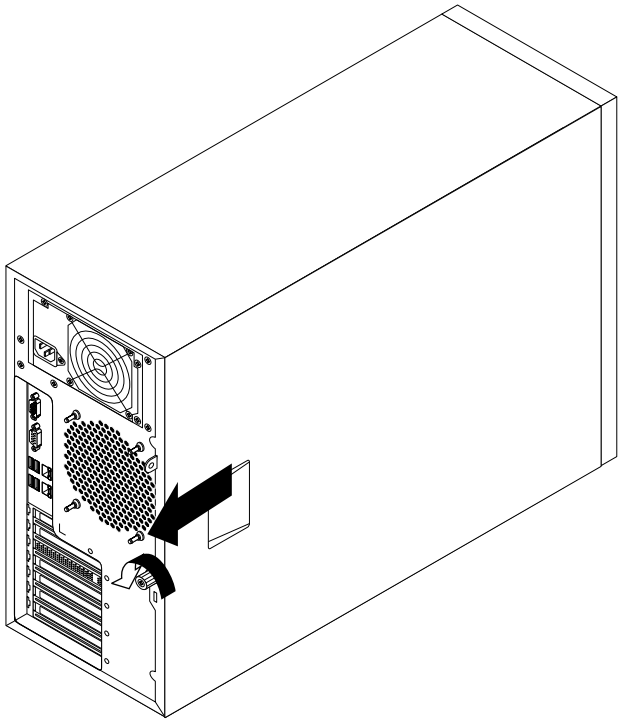


Figure 32. Sliding the server cover to the rear

6. Pivot the server cover outward to completely remove it.

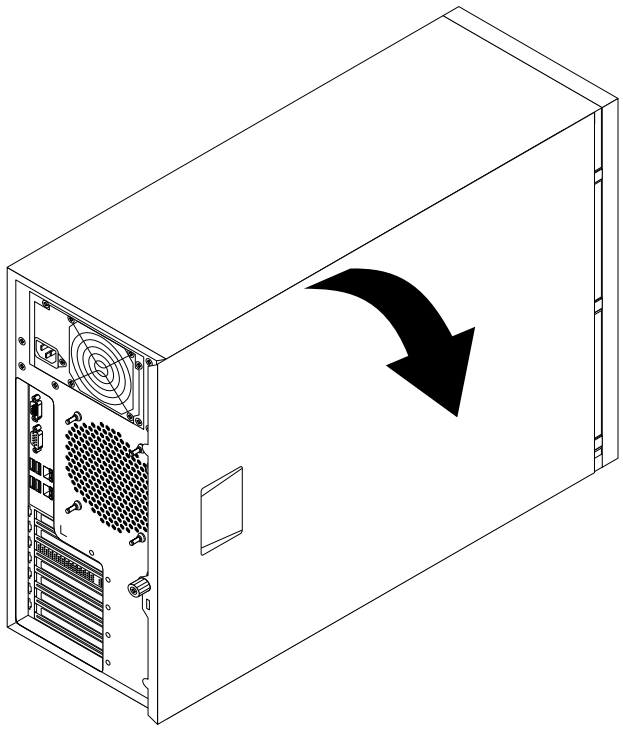


Figure 33. Removing the server cover

Attention: For proper cooling and airflow, install the server cover before turning on the server. Operating the server for more than 30 minutes with the server cover removed might damage server components.

To reinstall the server cover, see “Reinstalling the server cover and reconnecting cables” on page 162.

Removing and reinstalling the front bezel

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove and reinstall the front bezel.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To remove and reinstall the front bezel, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.

3. Remove the front bezel by releasing the three plastic tabs on the left side and pivoting the front bezel outward.

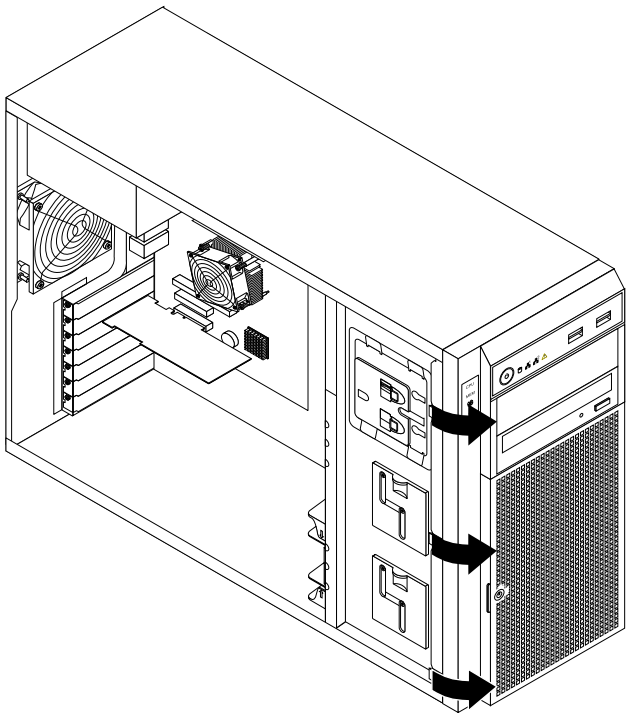


Figure 34. Removing the front bezel

4. To reinstall the front bezel, align the other three plastic tabs on the right side of the front bezel with the corresponding holes in the chassis, then pivot the front bezel inward until it snaps into position on the left side.

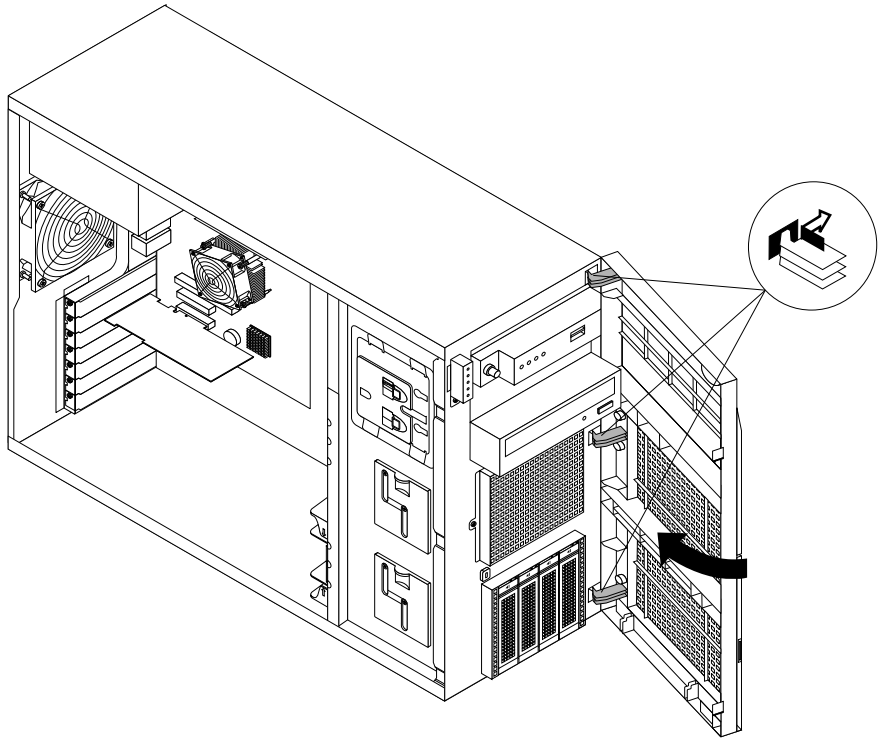


Figure 35. Installing the front bezel

5. Go to "Completing the parts replacement" on page 162.

Installing, removing, or replacing hardware

This topic provides instructions on how to install, remove, or replace hardware for your server. You can expand the capabilities of your server by adding new hardware devices, such as memory modules, PCI cards, or other server options, and maintain your server by replacing the failing hardware devices.

If you are handling a server option, refer to the appropriate installation and or removal instructions in this topic along with the instructions that come with the option.

Notes:

1. Use only parts provided by Lenovo.
2. Depending on the model, your server might look slightly different from the illustrations in this topic.

Installing or removing a memory module

This topic provides instructions on how to install or remove a memory module.

For a list of the ThinkServer memory module options, go to http://www.lenovo.com/thinkserver. Click the **Products** tab and then click **Options → ThinkServer Memory** to view the information.

Note: The memory modules are extremely sensitive to ESD. Make sure that you read and understand "Handling static-sensitive devices" on page 84 first and carefully perform the operation.

Memory module installation rules

Your server has four memory slots for installing or replacing DDR3 UDIMMs with ECC technology.

- Supports 2 GB and 4 GB 1333 MHz DDR3 UDIMMs
- Single-rank or dual-rank
- Minimum system memory: 2 GB (only one 2 GB memory module installed in the DIMMA2 slot)
- Maximum system memory: 16 GB (one 4 GB memory module installed in each of the four memory slots)

The following illustration helps you to locate the memory slots on the system board.

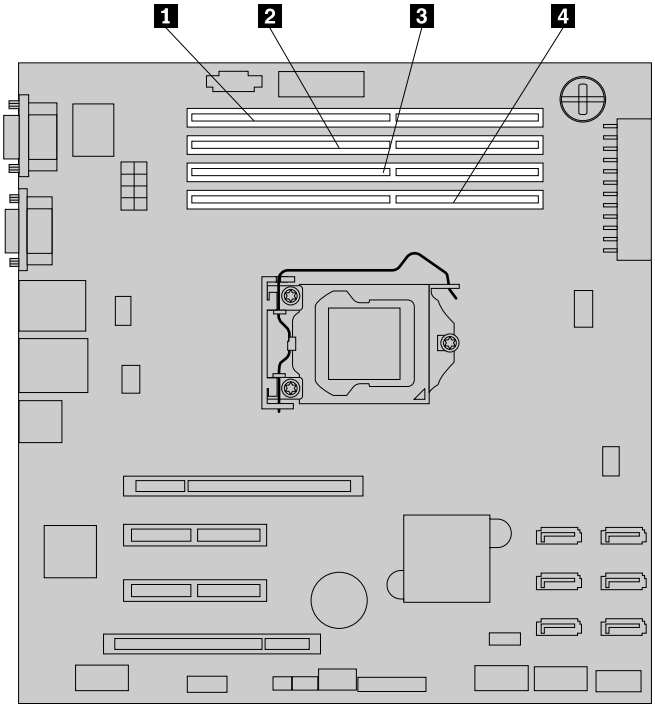


Figure 36. Memory slots on the system board

1 Memory slot 4 (DIMMB2)	3 Memory slot 2 (DIMMA2)
2 Memory slot 3 (DIMMB1)	4 Memory slot 1 (DIMMA1)

The following table provides information about the memory module installation rules that you should consider when installing or removing a memory module. The “X” mark indicates the memory slot(s) into which the memory module(s) should be installed in different situations. The numbers 1, 2, 3, and 4 indicate the installation sequence.

Note: The installed memory modules must be the same type with the same voltage and frequency.

UDIMM	DIMMA1	DIMMA2	DIMMB1	DIMMB2
One UDIMM		X		
Two UDIMMs		X, 1		X, 2
Three UDIMMs	X, 3	X, 1		X, 2
Four UDIMMs	X, 3	X, 1	X, 4	X, 2

Installing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install a memory module.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. To optimize system performance, make sure that you consider and follow the memory module installation rules when performing the operation. See “Memory module installation rules” on page 90.
2. Use any documentation that comes with the memory module and follow those instructions in addition to the instructions in this topic.

To install a memory module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the memory slots on the system board. See “System board components” on page 42.
5. Remove any parts or disconnect any cables that might prevent your access to the memory slots.
6. Open the retaining clips of the appropriate memory slot. See “Memory module installation rules” on page 90 for the installation sequence information.

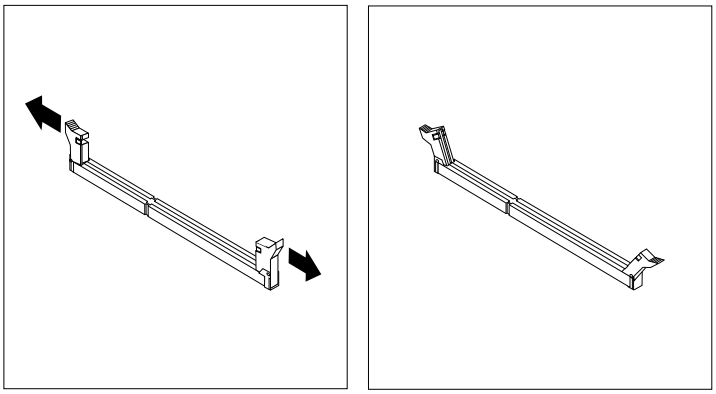


Figure 37. Opening the retaining clips of the memory slots

7. Touch the static-protective package that contains the new memory module to any unpainted surface on the outside of the server. Then, take the new memory module out of the package.

   Note: Carefully handle the memory module by its edges.

8. Position the new memory module over the memory slot. Make sure that the notch 1 on the new memory module is aligned with the key 2 in the memory slot. Then, press the new memory module straight down into the memory slot until the retaining clips close and the new memory module snaps into position.

   Note: If there is a gap between the memory module and the retaining clips, the memory module has not been correctly installed. Open the retaining clips, remove the memory module, and then reinstall it into the memory slot until the retaining clips are completely closed.

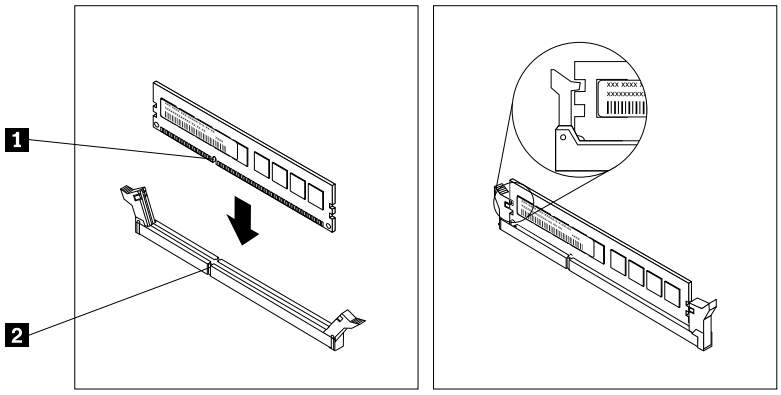


Figure 38. Installing a memory module

9. Reinstall any parts or reconnect any cables you have removed.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 162.

Removing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to remove a memory module.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: To optimize system performance, make sure that you consider and follow the memory module installation rules when performing the operation. See "Memory module installation rules" on page 90.

To remove a memory module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 85.
3. Lay the server on its side for easier operation.
4. Locate the memory slots on the system board. See "System board components" on page 42.
5. Remove any parts or disconnect any cables that might prevent your access to the memory slots.

6. Locate the appropriate memory module that you want to remove and open the retaining clips on both ends of the memory slot. Then, grasp the memory module by its edges and carefully pull it straight up to remove it from the memory slot.

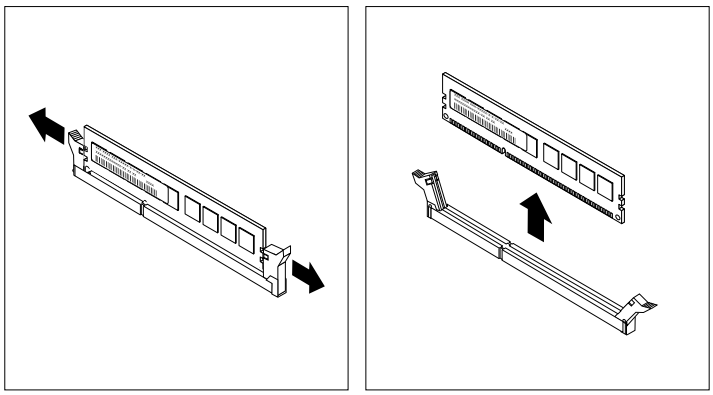


Figure 39. Removing a memory module

7. If you are instructed to return the old memory module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 162.

Installing or removing a PCI card

This topic provides instructions on how to install or remove a PCI card.

The EMI integrity and cooling of the server are protected by having all drive bays and PCI card slots covered or occupied. When you install an internal drive or PCI card, save the EMI shield or drive bay filler from the drive bay or save the PCI card slot bracket in the event that you later remove the device.

Attention: An unoccupied drive bay or PCI card slot without cover, shield, filler, or any other protection might impact the EMI integrity and cooling of the server, which might result in overheating or component damage.

Note: The PCI cards are extremely sensitive to ESD. Make sure that you read and understand "Handling static-sensitive devices" on page 84 first and carefully perform the operation.

Installing a PCI card

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to install a PCI card.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the PCI card and follow those instructions in addition to the instructions in this topic.

To install a PCI card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate an appropriate PCI card slot on the system board. See “System board components” on page 42 to identify the different types of PCI card slots in your server.
5. Remove the PCI card slot bracket by removing the screw that secures the metal bracket and then lifting the bracket out of the chassis. Store the PCI card slot bracket in the event that you later remove the PCI card and need the bracket to cover the place.

   Note: Carefully place the removed screw aside. You will need the screw later to secure the PCI card in place.

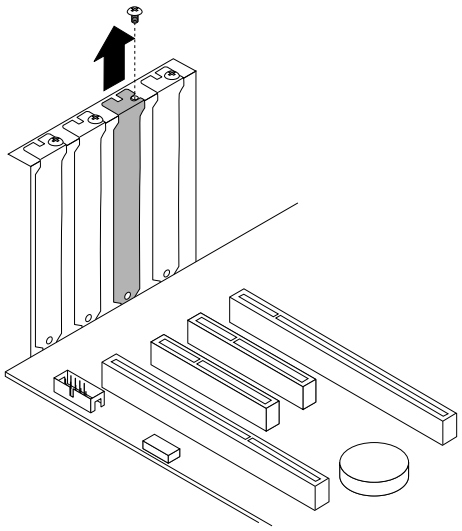


Figure 40. Removing a PCI card slot bracket

6. Touch the static-protective package that contains the new PCI card to any unpainted surface on the outside of the server. Then, take the new PCI card out of the package.

   Note: Carefully handle the PCI card by its edges.

7. Position the new PCI card on the PCI card slot for which you have removed the slot bracket and then carefully press the PCI card straight down until it is securely seated in the slot. Install the screw to secure the PCI card in place.

   Note: Your PCI card might look different from the following illustration depending on the specific type.

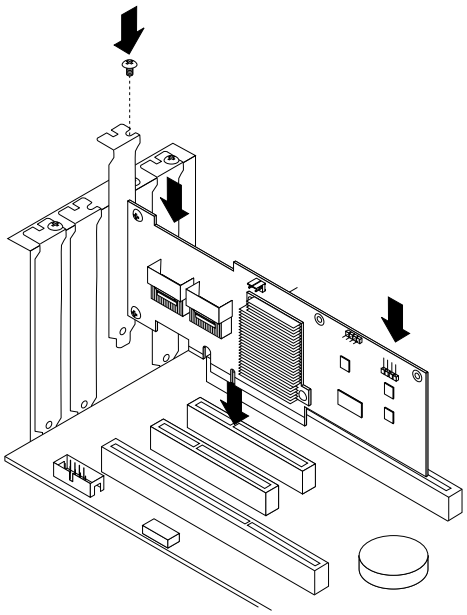


Figure 41. Installing a PCI card

8. Depending on the type of the PCI card, you might need to connect any required cables. Refer to the documentation that comes with the PCI card for specific information.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 162.

Removing a PCI card

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove a PCI card.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the PCI card and follow those instructions in addition to the instructions in this topic.

To remove a PCI card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.

4. Locate the PCI card you want to remove. See “System board components” on page 42.
5. If necessary, remove any parts or disconnect any cables that might impede your access to the PCI card. Depending on the type of the PCI card, you might also need to disconnect any cables from the PCI card, the system board, and or the hot-swap hard disk drive backplane.
6. Remove the screw that secures the PCI card. Then, grasp the PCI card by its edges and carefully pull it out of the PCI card slot.

   Note: The PCI card fits tightly into the PCI card slot. If necessary, alternate moving each side of the PCI card a small and equal amount until it is completely removed from the slot.

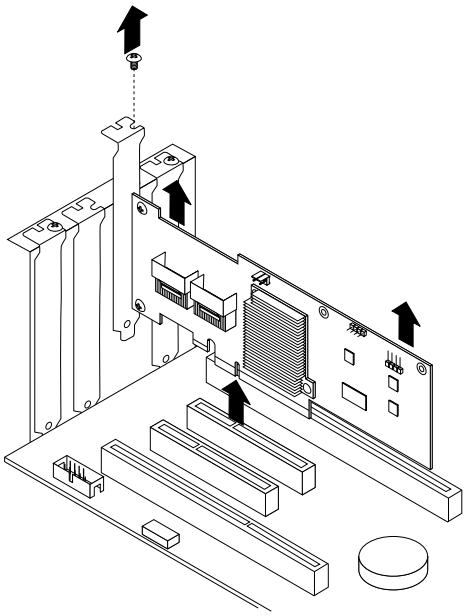


Figure 42. Removing a PCI card

7. Install a new PCI card to replace the old one or install a PCI card slot bracket to cover the place. See “Installing a PCI card” on page 93.
8. If you are instructed to return the old PCI card, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 162.

Installing or removing the Ethernet card

This topic provides instructions on how to install or remove the Ethernet card.

Installing the Ethernet card

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install the Ethernet card and how to install the Ethernet card driver on Windows operating systems.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the Ethernet card and follow those instructions in addition to the instructions in this topic.

To install the Ethernet card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate an appropriate PCI card slot on the system board for installing the Ethernet card. You can install the Ethernet card to the PCI-E slot 2 or PCI-E slot 3 that supports a card with 167 mm (6.57 inches) in length. See “System board components” on page 42 to identify the different types of PCI card slots in your server.
5. Remove any parts or disconnect any cables that might impede your operation.
6. Touch the static-protective package that contains the Ethernet card to any unpainted surface on the outside of the server. Then, take the Ethernet card out of the package.

   Note: Carefully handle the Ethernet card by its edges.
7. The Ethernet card is a kind of PCI card. See “Installing a PCI card” on page 93 and follow those instructions to install the Ethernet card.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 162. Then, continue with the following procedure to install the Ethernet card driver if you are using a Windows operating system. On Linux operating systems, you do not need to install any device driver for the Ethernet card.

On Windows operating systems, do the following to install the device driver for the Ethernet card:

1. Save any open documents and exit all applications.
2. Click **Start**. Rright-click **My Computer** and select **Properties**. The System Properties window opens.
3. Click the **Device Manager** button on the **Hardware** tab. The Device Manager window opens.
4. Expand the **Network adapters**.
5. Right-click one of the Ethernet cards (PRO/1000PT or the yellow question mark).
6. Select **Update Driver**. The Hardware Update Wizard window opens. You will be asked if you permit Windows to connect to Windows Update to search for software.
7. Make a selection depending on your needs and click **Next**.
8. Insert the *ThinkServer EasyStartup* DVD that comes with your server into the optical drive.

   Note: You do not need to use the driver disc that comes with the Ethernet card.
9. Select **Install the software automatically (Recommended)** and click **Next** to continue.
10. Follow the instructions on the screen to complete the installation.

Removing the Ethernet card

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove the Ethernet card.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the Ethernet card and follow those instructions in addition to the instructions in this topic.

To remove the Ethernet card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the Ethernet card. The Ethernet card can be in the PCI-E slot 2 or the PCI-E slot 3 that supports a card with 167 mm (6.57 inches) in length. See “System board components” on page 42.
5. The Ethernet card is a kind of PCI card. See “Removing a PCI card” on page 95 and follow those instructions to remove the Ethernet card.
6. If you are instructed to return the old Ethernet card, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 162.

Installing or removing the RAID card

This topic provides instructions on how to install or remove the RAID card.

A specific RAID card is required for server models with more than four hard disk drives or models that use SAS hard disk drives. You can also install the RAID card for advanced SATA/SAS hardware RAID functions. For more information, see “RAID card” on page 33 and “Configuring RAID” on page 71.

Note: This topic applies only to models that support the RAID card.

Installing the RAID card

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install the RAID card.

Attention: Make sure that you back up your data before installing the RAID card because you might need to reconfigure RAID and reinstall the operating system after installing the RAID card.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the RAID card and follow those instructions in addition to the instructions in this topic.

To install the RAID card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the PCI-E slot 3 on the system board. See “System board components” on page 42.
5. Remove any parts or disconnect any cables that might impede your operation.
6. Touch the static-protective package that contains the RAID card to any unpainted surface on the outside of the server. Then, take the RAID card out of the package.

   Note: Carefully handle the RAID card by its edges.
7. The RAID card is a kind of PCI card. See “Installing a PCI card” on page 93 and follow those instructions to install the RAID card.
8. Connect cables depending on your specific server configuration. See “Connecting cables” on page 38.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 162. Then, configure RAID for your server. See “Configuring RAID” on page 71.

Removing the RAID card

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove the RAID card.

Attention: Make sure that you back up your data before removing the RAID card because you might need to reconfigure RAID and reinstall the operating system after removing the RAID card. If you remove the RAID card, you will lose the advanced SATA/SAS hardware RAID functions. Also, a specific RAID card is required for server models with more than four hard disk drives or models that use SAS hard disk drives.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the RAID card and follow those instructions in addition to the instructions in this topic.

To remove the RAID card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the RAID card, which is installed in the PCI-E slot 3 on the system board. See “System board components” on page 42.
5. Remove any parts or disconnect any cables that might impede your operation.
6. Disconnect all cables from the RAID card and any other related parts.

   Note: If you want to install a new RAID card after removing the old one, note down the cable connections before disconnecting the cables.
7. The RAID card is a kind of PCI card. See “Removing a PCI card” on page 95 and follow those instructions to remove the RAID card.

   Note: Carefully handle the RAID card by its edges.

8. Depending on your specific server configuration, you might need to connect the SATA hard disk drives to the SATA connectors on the system board if no RAID card is installed. See “Connecting cables” on page 38.
9. If you are instructed to return the old RAID card, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 162. Then, you need to reconfigure RAID for your server. See “Configuring RAID” on page 71.

Installing or removing the ThinkServer 9240-8i RAID 5 Upgrade Key

This topic provides instructions on how to install or remove the ThinkServer 9240-8i RAID 5 Upgrade Key (hereinafter referred to as the RAID 5 key).

The RAID 5 key expands the capability of the installed RAID card (ThinkServer 9240-8i RAID 0/1 Adapter) by activating RAID 5 and 50 levels for advanced SATA/SAS hardware RAID. You can purchase a RAID 5 key directly from Lenovo.

Installing the RAID 5 key on the RAID card

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install the RAID 5 key on the RAID card.

Note: This topic applies only to models that have a RAID card installed.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the RAID 5 key and follow those instructions in addition to the instructions in this topic.

To install the RAID 5 key on the RAID card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the RAID card, which is installed in the PCI-E slot 3 on the system board. See “System board components” on page 42.
5. Remove any parts or disconnect any cables that might impede your operation.
6. Touch the static-protective package that contains the RAID 5 key to any unpainted surface on the outside of the server. Then, take the RAID 5 key out of the package.

   Note: Carefully handle the RAID 5 key by its edges.

7. Locate the RAID 5 key connector on the RAID card and then insert the RAID 5 key into the connector. You might want to remove the RAID card first, install the RAID 5 key on the RAID card, and then reinstall the RAID card. See “Installing or removing the RAID card” on page 98.

   Note: Make sure that the RAID 5 key is securely seated on the RAID card.

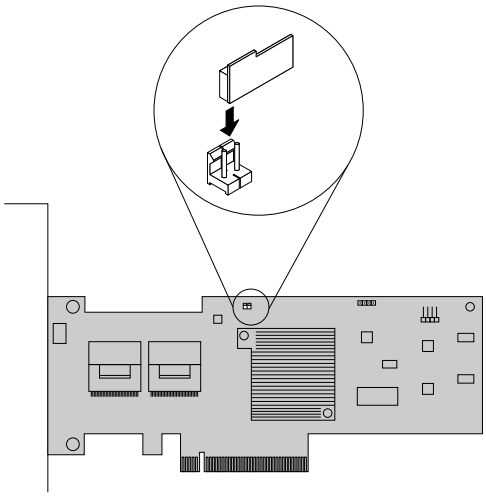


Figure 43. Installing the RAID 5 key on the RAID card

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 162. Then, the hardware RAID 5 and 50 levels are available for your server if your server has the required number of hard disk drives installed. Refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server for information about how to configure the hardware RAID.

Removing the RAID 5 key from the RAID card

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove the RAID 5 key from the RAID card.

Notes:

1. This topic applies only to server models that have a RAID card with the RAID 5 key option installed.
2. If you remove the RAID 5 key from the RAID card, the hardware RAID 5 and 50 levels are not available.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the RAID 5 key and follow those instructions in addition to the instructions in this topic.

To remove the RAID 5 key from the RAID card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.

3. Lay the server on its side for easier operation.
4. Locate the RAID card, which is installed in the PCI-E slot 3 on the system board. See “System board components” on page 42.
5. Remove any parts or disconnect any cables that might impede your operation.
6. Locate the RAID 5 key on the RAID card and then remove it from the RAID card. You might need to remove the RAID card first, remove the RAID 5 key from the RAID card, and then reinstall the RAID card. See “Installing or removing the RAID card” on page 98.

   Note: Carefully handle the RAID 5 key by its edges.

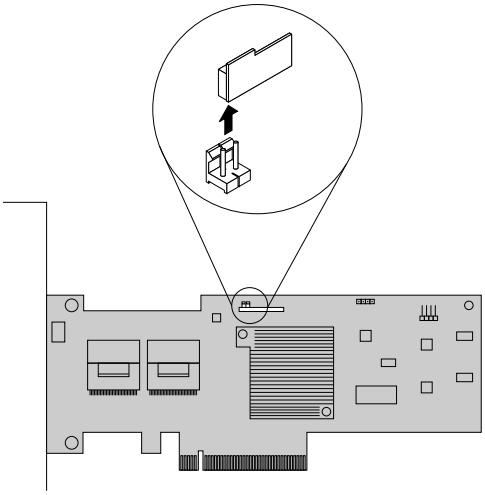


Figure 44. Removing the RAID 5 key from the RAID card

7. If you are instructed to return the old RAID 5 key, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 162. As the hardware RAID 5 and 50 levels are not available without the RAID 5 key, you might need to reconfigure RAID for your server. Refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server for information about how to configure the hardware RAID.

Installing or removing the ThinkServer SATA Software RAID 5 Key

This topic provides instructions on how to install or remove the ThinkServer SATA Software RAID 5 Key (hereinafter referred to as the system board RAID 5 key).

The system board RAID 5 key expands the capability of the system board by activating RAID 5 for the onboard SATA software RAID. You can purchase a system board RAID 5 key directly from Lenovo.

Installing the system board RAID 5 key

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install the system board RAID 5 key.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the system board RAID 5 key and follow those instructions in addition to the instructions in this topic.

To install the system board RAID 5 key, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Touch the static-protective package that contains the system board RAID 5 key to any unpainted surface on the outside of the server. Then, take the system board RAID 5 key out of the package.
5. Locate the iButton socket on the system board. Insert one side of the system board RAID 5 key under one of the retaining clips on the iButton socket. Then, carefully press the other side of the system board RAID 5 key straight down until the key snaps into position and is secured by the two retaining clips on the iButton socket.

   Note: If necessary, remove any parts or disconnect any cables that might impede your operation.

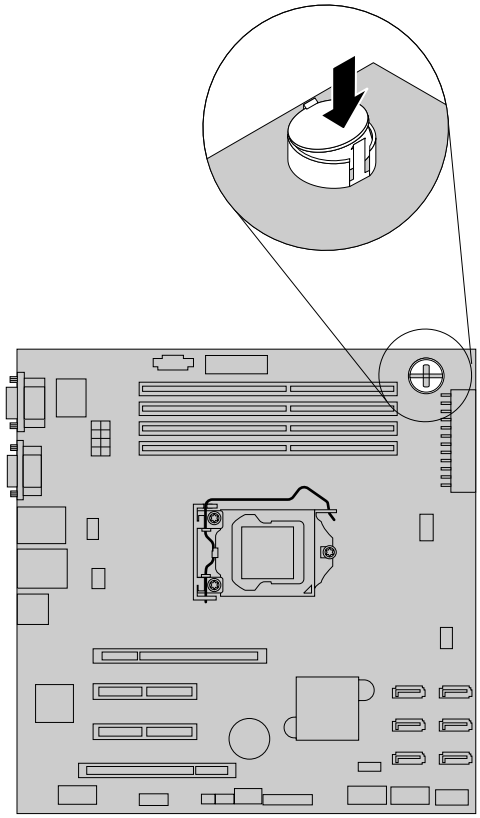


Figure 45. Installing the system board RAID 5 key

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation, go to “Completing the parts replacement” on page 162. Then, the onboard SATA software RAID 5 is available for your server if your server has the required number of hard disk drives installed. To configure RAID, see “Configuring RAID” on page 71.

Removing the system board RAID 5 key

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove the system board RAID 5 key.

Notes:

1. This topic applies only to servers that have a system board RAID 5 key option installed.
2. If you remove the system board RAID 5 key, the onboard SATA software RAID 5 will be disabled.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the system board RAID 5 key and follow those instructions in addition to the instructions in this topic.

To remove the system board RAID 5 key, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.

4. Locate the iButton socket on the system board. Open the retaining clip **1** on the iButton socket to release the system board RAID 5 key and then completely remove the key from the iButton socket.

   Note: If necessary, remove any parts or disconnect any cables that might impede your operation.

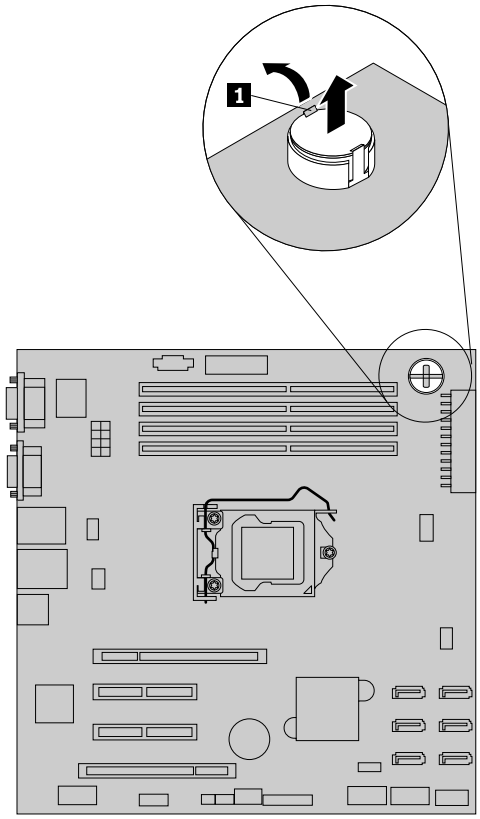


Figure 46. Removing the system board RAID 5 key

5. If you are instructed to return the old system board RAID 5 key, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 162. As the onboard SATA software RAID 5 is not available without the system board RAID 5 key, you might need to reconfigure RAID for your server. See "Configuring RAID" on page 71.

Installing or removing the ThinkServer iKVM Remote Management Module

This topic provides instructions on how to install or remove the ThinkServer iKVM Remote Management Module (hereinafter referred to as the iKVM key).

The iKVM key offers convenient, remote KVM access and control through the LAN or Internet. You can use the iKVM key to gain location-independent remote access to respond to critical incidents and to undertake necessary maintenance. Therefore, working as an integrated solution in your server, the iKVM key provides

an increased level of manageability over the basic server management available to the system board. You can purchase an iKVM key directly from Lenovo.

Installing the iKVM key

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install the iKVM key.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the iKVM key and follow those instructions in addition to the instructions in this topic.

To install the iKVM key, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Touch the static-protective package that contains the iKVM key to any unpainted surface on the outside of the server. Then, take the iKVM key out of the package.

5. Locate the iKVM key connector on the system board and then insert the iKVM key into the iKVM key connector.

   Note: Make sure that the iKVM key is securely seated on the system board.

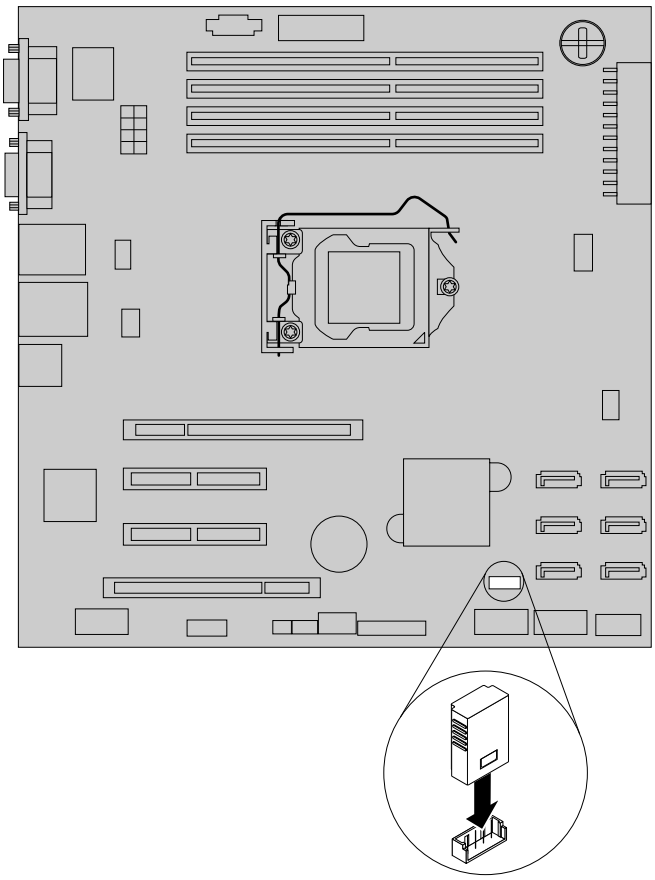


Figure 47. Installing the iKVM key

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 162. Then, you can refer to the *Remote Management Module User Guide* on the documentation DVD that comes with your server for more information about the iKVM function and server remote management.

Removing the iKVM key

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to remove the iKVM key if the server has one installed.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. Use any documentation that comes with the iKVM key and follow those instructions in addition to the instructions in this topic.
2. If you remove the iKVM key, the iKVM function for server remote management is unavailable.

To remove the iKVM key, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the iKVM key on the system board and then lift the iKVM key straight up to remove it from the iKVM key connector.

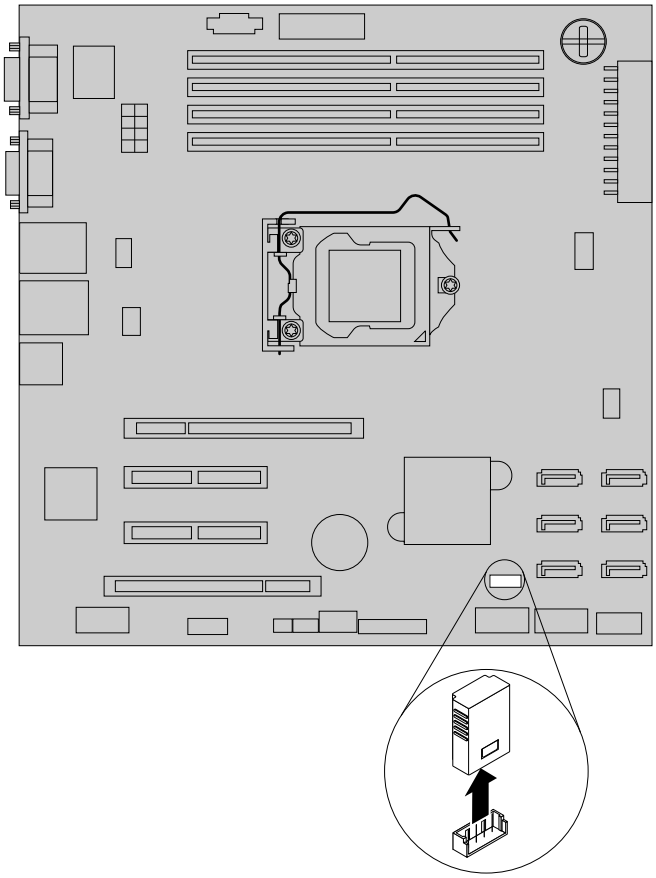


Figure 48. Removing the iKVM key

5. If you are instructed to return the old iKVM key, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 162.

Installing or removing the TPM module

This topic provides instructions on how to install or remove the TPM module.

The TPM module is a security chip designed by the Trusted Computing Group (TCG) to provide a hardware method of data encryption. It stores passwords, encryption keys, and digital certificates to help provide security solutions and protect the computer.

Installing the TPM module

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to install the TPM module.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the TPM module and follow those instructions in addition to the instructions in this topic.

To install the TPM module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 85.
3. Lay the server on its side for easier operation.
4. Touch the static-protective package that contains the TPM module to any unpainted surface on the outside of the server. Then, take the TPM module out of the package.

   Note: Carefully handle the TPM module by its edges.

5. Locate the TPM connector on the system board and then insert the TPM module into the TPM connector.

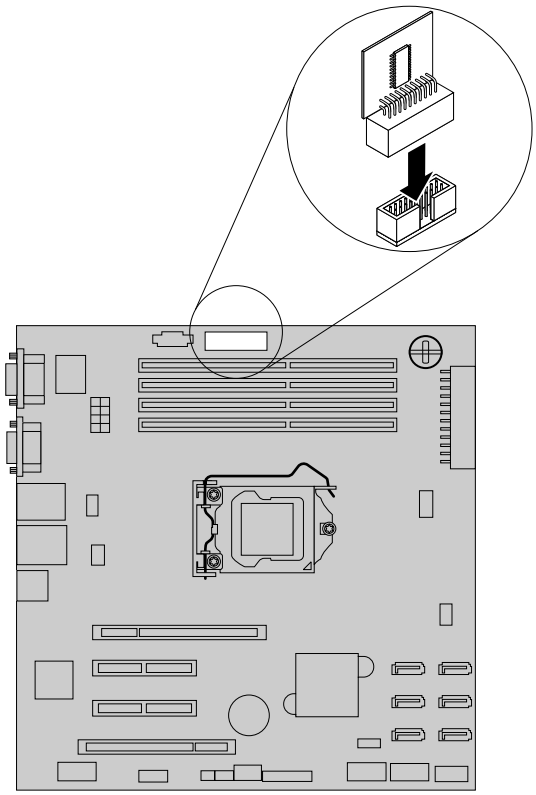


Figure 49. Installing the TPM module

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 162. Then, you can configure the TPM function in the Setup Utility program. See “Configuring the TPM function” on page 66.

Removing the TPM module

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove the TPM module if the server has one installed.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. Use any documentation that comes with the TPM module and follow those instructions in addition to the instructions in this topic.
2. If you remove the TPM module, the TPM function is unavailable.

To remove the TPM module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the TPM connector on the system board and then remove the TPM module installed on the TPM connector by lifting it straight up.

   Note: Carefully handle the TPM module by its edges.

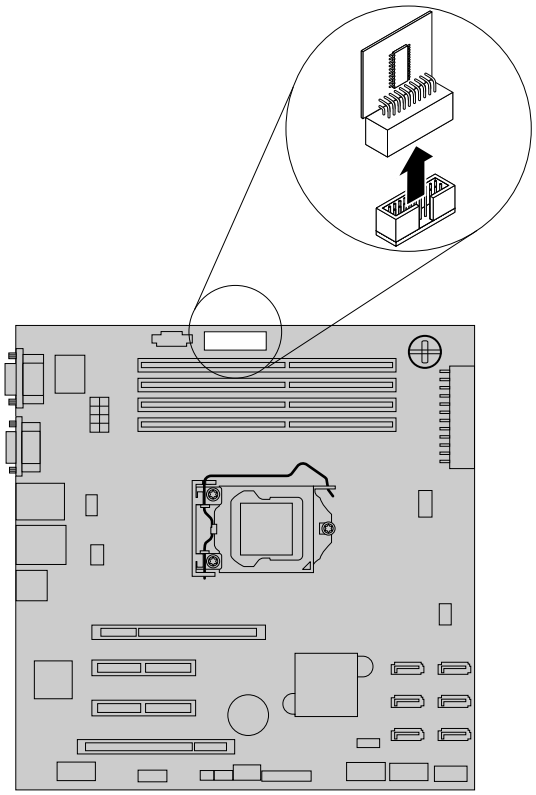


Figure 50. Removing the TPM module

5. If you are instructed to return the old TPM module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 162.

Installing or removing the DIT module

This topic provides instructions on how to install or remove the DIT module.

The DIT module, which is only available in some models, provides diagnostic LEDs through the DIT panel to help you easily identify a problem. The diagnostic LEDs on the DIT panel also vary depending on the installed power supply. For more information, see “DIT module” on page 18.

Installing the DIT module

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install the DIT module.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To install the DIT module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 87.
4. Touch the static-protective package that contains the DIT module to any unpainted surface on the outside of the server. Then, take the DIT module out of the package.
5. Connect the signal cable to the rear of the DIT module.
6. Route the signal cable of the DIT module through the corresponding hole in the chassis and position the DIT module on the chassis so that the screw hole in the DIT module is aligned with the corresponding screw hole **1** in the chassis. Then, install the screw to secure the DIT module in place.

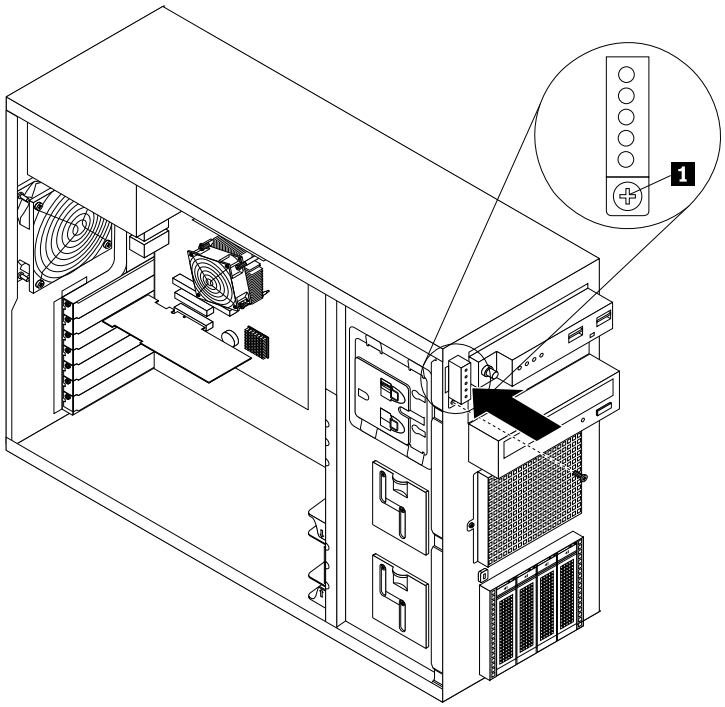


Figure 51. Installing the DIT module

7. Remove the front system fan(s). See “Replacing the front system fan” on page 149.

8. Connect the other end of the signal cable to the DIT module connector on the system board. See “System board components” on page 42. Then, properly route the signal cable of the DIT module. You might need to secure the signal cable with cable clips or ties in the chassis.

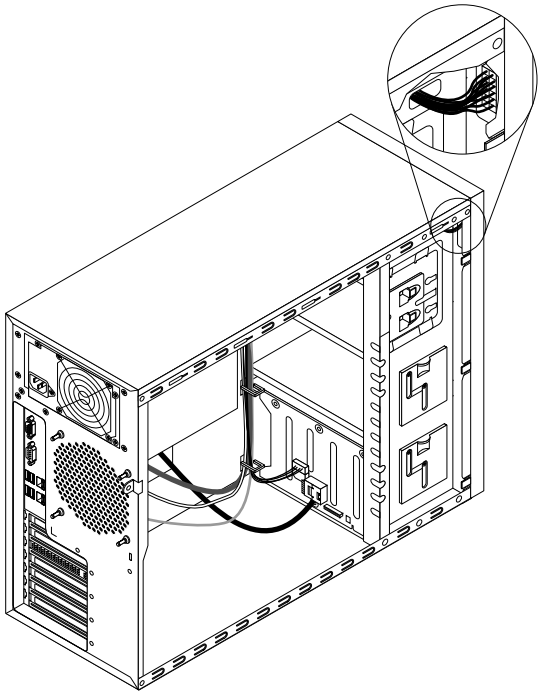


Figure 52. Cable routing

9. Reinstall the front system fan(s). See “Replacing the front system fan” on page 149.
10. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 87.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 162.

Removing the DIT module

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to remove the DIT module.

This topic applies only to server models that come with the DIT module.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. Depending on the model, your server might look slightly different from the illustration in this topic.
2. If you remove the DIT module, the server will lose the diagnostic LEDs on the DIT panel.

To remove the DIT module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 87.
4. Locate the DIT module. See “DIT module” on page 18.
5. Remove the front system fan(s). See “Replacing the front system fan” on page 149.
6. Disconnect the signal cable of the DIT module from the DIT module connector on the system board. See “System board components” on page 42.
7. If necessary, remove any parts or disconnect any cables that might impede your access to the signal cable of the DIT module. Note the cable routing and then release the signal cable of the DIT module from any cable clips or ties in the chassis.
8. Remove the screw **1** on the chassis that secures the DIT module. Then, carefully remove the DIT module from the chassis and pull the signal cable of the DIT module out of the hole in the chassis.

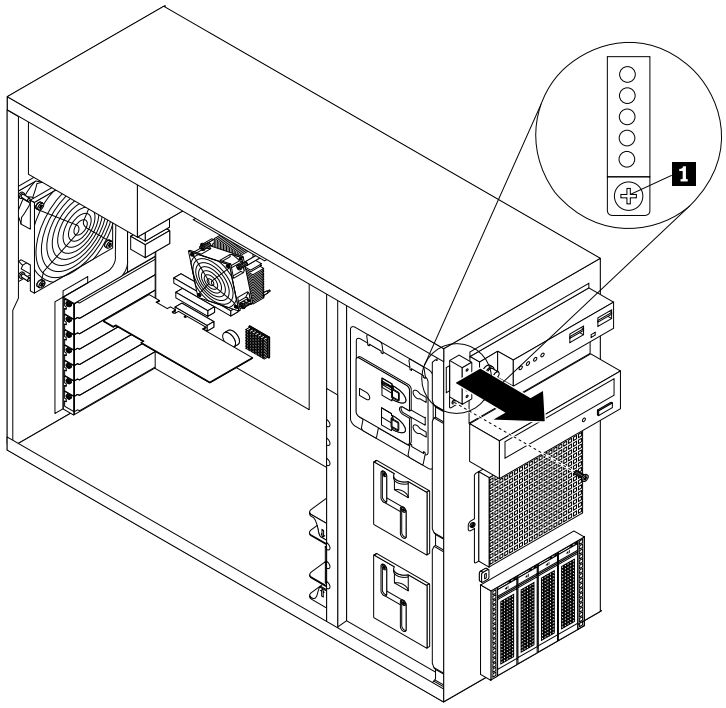


Figure 53. Removing the DIT module

9. Disconnect the signal cable from the rear of the DIT module.
10. Reinstall the front system fan(s). See “Replacing the front system fan” on page 149.
11. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 87.
12. If you are instructed to return the old DIT module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 162.

Installing or replacing an optical drive

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install or replace an optical drive.

The EMI integrity and cooling of the server are protected by having all drive bays covered or occupied. Your server has two optical drive bays. If only one optical drive is installed in the lower bay, the upper bay is covered by a metal EMI shield on the chassis and also a plastic shield on the front bezel. When you install a secondary optical drive or a RDX USB drive bundle, save the removed EMI shield from the chassis and plastic shield from the front bezel in the event that you later remove the drive and need the shields to cover the drive bay.

Attention: An unoccupied drive bay without any other protection might impact the EMI integrity and cooling of the server, which might result in overheating or component damage. To maintain the EMI integrity and cooling of the server, install a new optical drive as soon as you remove the failing one or the protective shields.

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Before you begin, consider the following optical drive installation rules:

- The server has two optical drive bays. If the server has only one optical drive installed, make sure that the optical drive is installed in the lower bay (optical drive bay 1). The upper bay is for a secondary optical drive or a RDX USB drive bundle (server option).
- The following table provides information about the recommended power connector and connector on the system board for the installed optical drive or RDX USB drive bundle. See “Server components” on page 25 for the locations of the optical drive bays and “System board components” on page 42 for the locations of the connectors on the system board.

Drive bay	Drive	Power connector	Connector on the system board
Optical drive bay 1 (lower bay)	An optical drive installed	P11	SATA 5 connector
Optical drive bay 2 (upper bay)	An optical drive installed in some models	P12	SATA 4 connector
	A RDX USB drive bundle (server option)	P6	Internal dual-port USB 2.0 connector 2

Note: For information about the RDX USB drive bundle and instructions on how to install it, refer to the documentation that comes with the RDX USB drive bundle. You can purchase this option directly from Lenovo. The option name is Lenovo Removable Disk Technology (RDX) USB Drive Bundle.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. Depending on the model, your server might look slightly different from the illustrations in this topic.
2. Use any documentation that comes with the optical drive and follow those instructions in addition to the instructions in this topic.

To install or replace an optical drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Locate the optical drive bays. See “Server components” on page 25.
4. Depending on whether you are installing or replacing an optical drive, do one of the following:
   - If you are installing a secondary optical drive in the upper optical drive bay, remove the front bezel. See “Removing and reinstalling the front bezel” on page 87. Then, remove the plastic shield for the bay from the front panel. Remove the screw **1** that secures the metal EMI shield covered on the upper optical drive bay. Insert a finger into the hole in the EMI shield and carefully pull the EMI shield out of the front of the chassis.

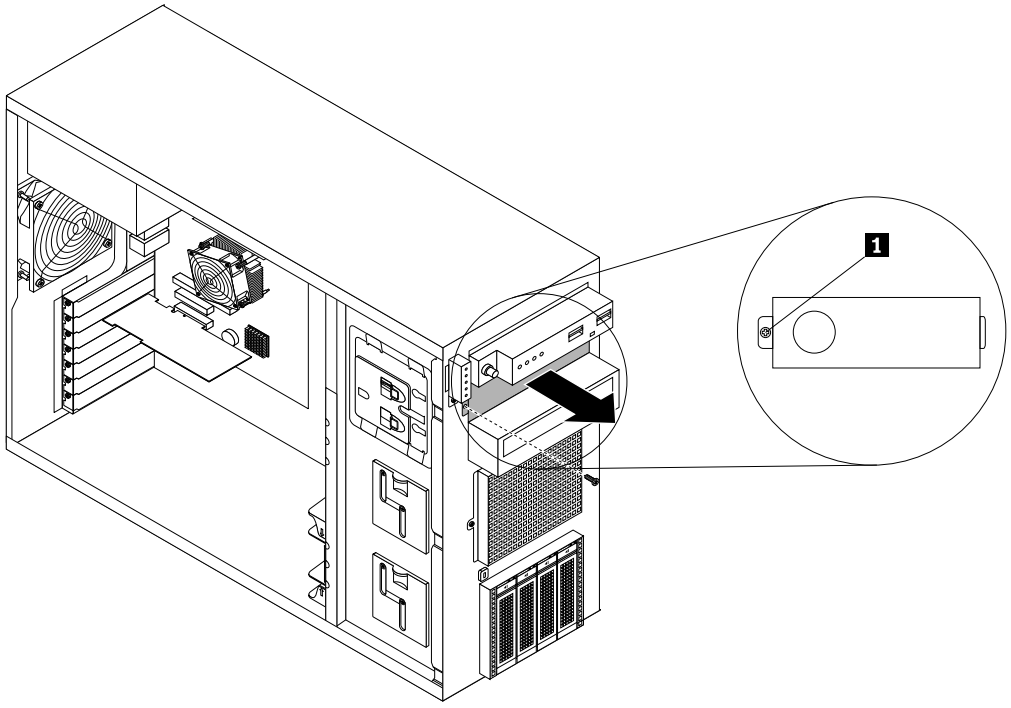


Figure 54. Removing the EMI shield for the upper optical drive bay

- If you are replacing an optical drive, disconnect the signal cable and the power cable from the rear of the optical drive. Press the release button **1** in the direction as shown and push the optical drive from the rear until it is projected from the front of the chassis. Then, hold the optical drive from the front and completely slide it out of the chassis.

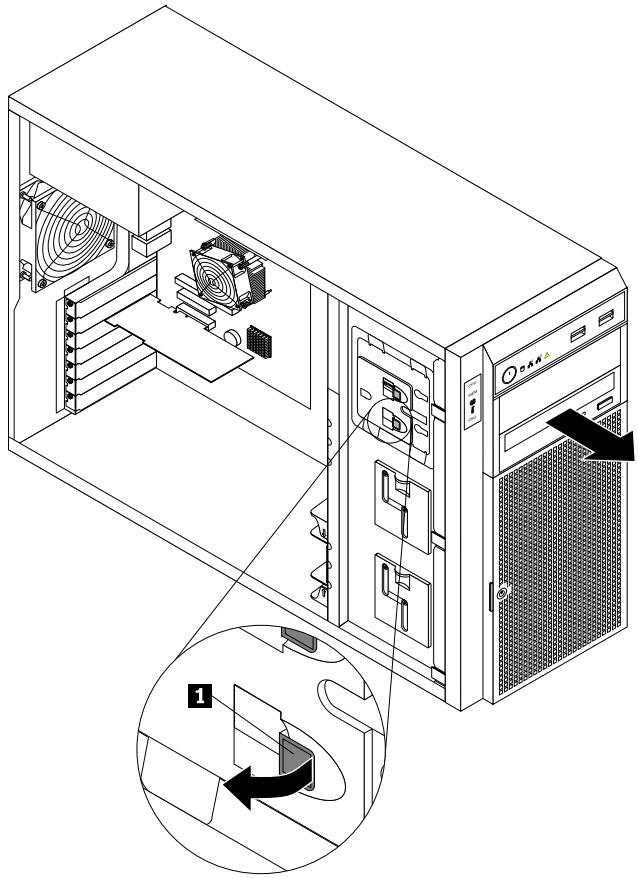


Figure 55. Removing the optical drive

5. Touch the static-protective package that contains the new optical drive to any unpainted surface on the outside of the server. Then, take the new optical drive and the signal cable out of the package.

6. Slide the new optical drive into the drive bay from the front until it snaps into position.

   Note: You do not need to remove the front bezel when replacing an optical drive. However, if you are adding a secondary optical drive in the upper optical drive bay, you need to remove the front bezel first and then gain access to the protective shields to remove them. The following illustration shows only the situation in which the front bezel has not been removed.

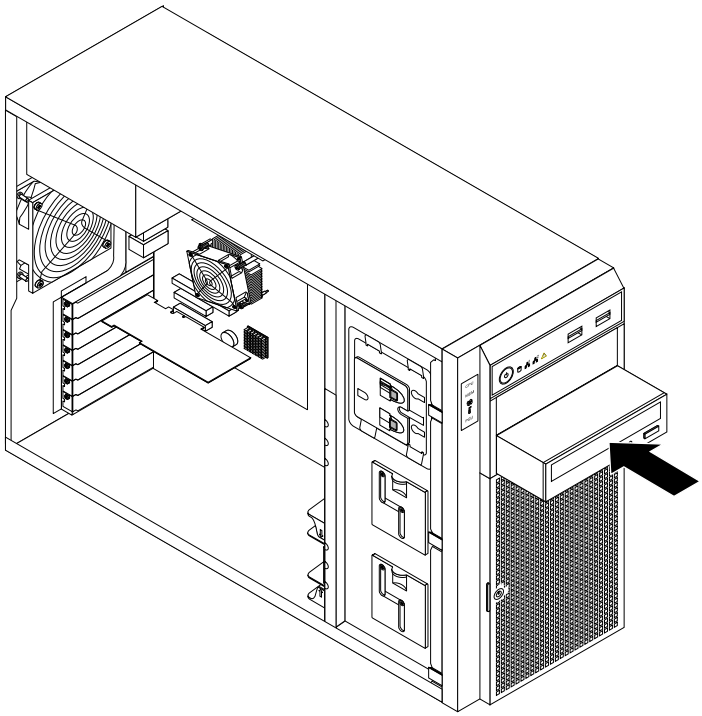


Figure 56. Installing the optical drive

7. Connect the appropriate power cable **1** and the signal cable **2** to the rear of the new optical drive.

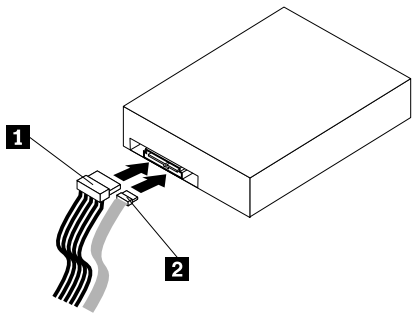


Figure 57. Connecting cables to the rear of the optical drive

8. If necessary, connect the other end of the signal cable to the appropriate SATA connector on the system board. See “System board components” on page 42.
9. Reinstall the front bezel if you have removed it. See “Removing and reinstalling the front bezel” on page 87.
10. Do one of the following:

- If you are installing an optical drive, save the removed EMI-protective shield from the chassis and plastic shield from the front bezel in the event that you later remove the drive and need the shields to cover the drive bay.
- If you are replacing an optical drive and are instructed to return the old optical drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 162.

Installing or replacing a hot-swap hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to install or replace a hot-swap hard disk drive.

This topic applies only to server models that have hot-swap hard disk drive(s) installed. See “Features” on page 7 for more information about the supported hot-swap hard disk drives.

For a list of the ThinkServer hard disk drive options, go to http://www.lenovo.com/thinkserver. Click the **Products** tab and then click **Options → ThinkServer Hard Drives** to view the information.

You can install or replace a hot-swap hard disk drive without turning off the server, which helps you avoid significant interruption to the operation of the system.

The EMI integrity and cooling of the server are protected by having all drive bays covered or occupied. The number of the installed hard disk drives in your server varies depending on the server model. The vacant bays are either covered by an EMI-protective panel or occupied by dummy hard disk drive trays. When you install a hot-swap hard disk drive, save the removed dummy hard disk drive tray from the drive bay in the event that you later remove the hot-swap hard disk drive and need the dummy tray to cover the place.

Attention: An unoccupied drive bay without any other protection might impact the EMI integrity and cooling of the server, which might result in overheating or component damage. To maintain the EMI integrity and cooling of the server, install a new hot-swap hard disk drive as soon as you remove the failing one or the dummy tray.

Before you begin, consider the following hard disk drive installation rules:

- Follow the order of the hard disk drive bays when installing a hard disk drive. See “Server components” on page 25 to locate the hard disk drive bays in your server.
- For RAID configuration, the hard disk drives must be the same type with the same capacity if they are within a single RAID array. For more information, see “Configuring RAID” on page 71.
- For hard disk drives with different capacities, install the hard disk drive with the lowest capacity first.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. Depending on the model, your server might come with 3.5-inch hot-swap hard disk drive(s) or 2.5-inch hot-swap hard disk drive(s). The illustrations in this topic are based on server models with four 3.5-inch hot-swap SATA or SAS hard disk drives. For other models, the replacement procedure is the same.
2. Depending on the model, your server might look slightly different from the illustrations in this topic.

3. Use any documentation that comes with the hot-swap hard disk drive and follow those instructions in addition to the instructions in this topic.

To install or replace a hot-swap hard disk drive, do the following:

1. Use the front door key to unlock the front door and then use the front door handle **1** to pivot the front door to the open position.

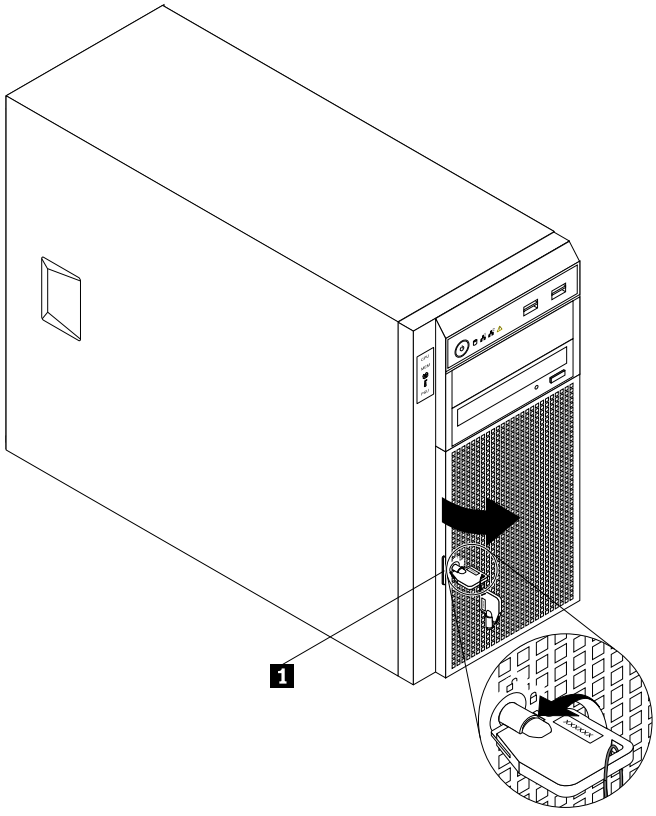


Figure 58. Opening the front door of the server

2. Locate the appropriate hard disk drive bay. See “Server components” on page 25.

3. Press the release button **1** to open the handle of the hot-swap hard disk drive or the dummy tray.

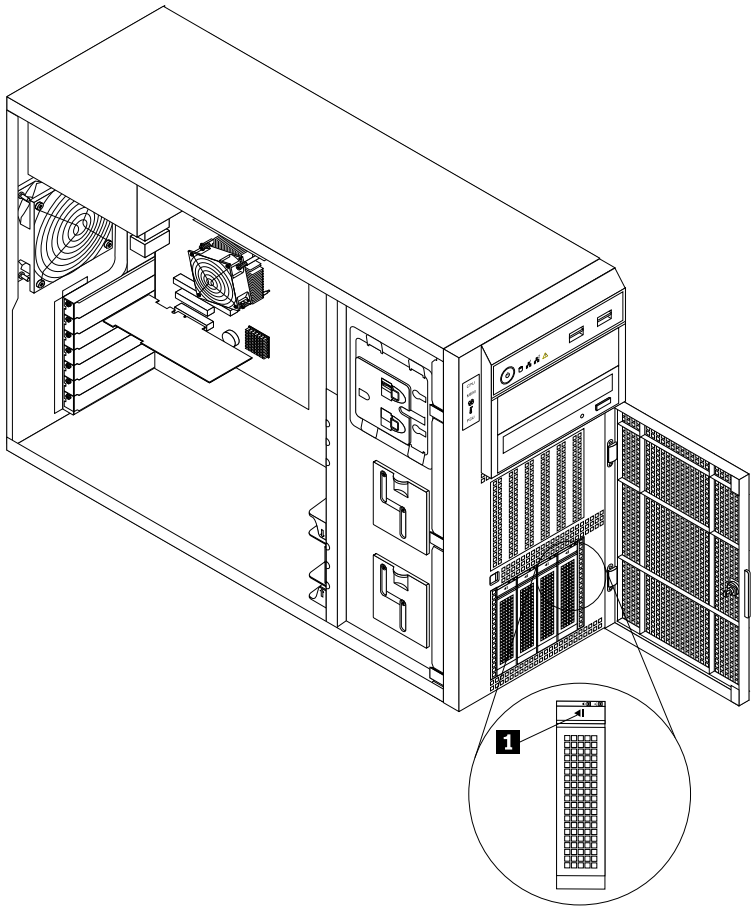


Figure 59. Opening the handle of the hot-swap hard disk drive or the dummy tray

4. Pull the handle and carefully slide the hot-swap hard disk drive or the dummy tray out of the front of the chassis.

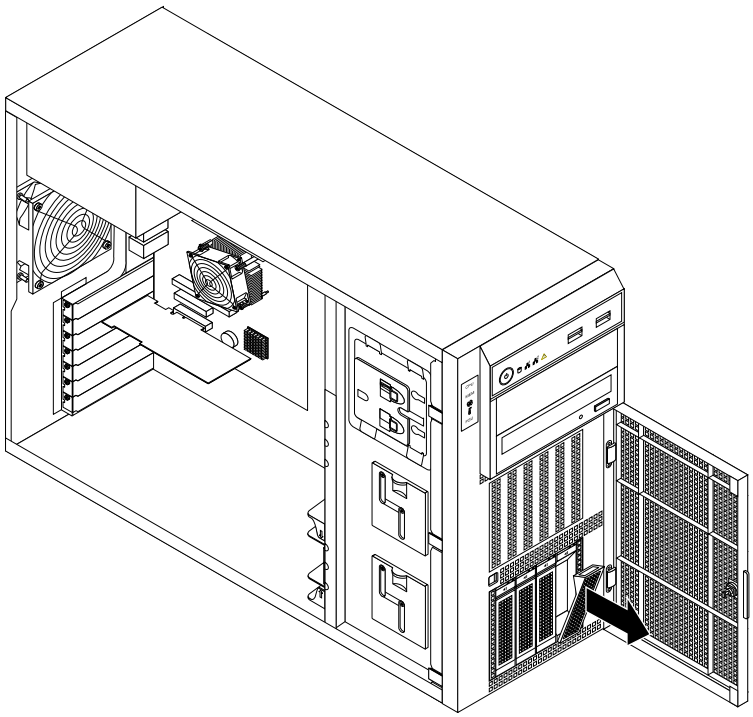


Figure 60. Removing the hot-swap hard disk drive or the dummy tray

5. Touch the static-protective package that contains the new hot-swap hard disk drive to any unpainted surface on the outside of the server. Then, take the new hot-swap hard disk drive out of the package.

   Note: Do not touch the circuit board on the hard disk drive.

6. Slide the new hot-swap hard disk drive into the drive bay from the front until it snaps into position and then completely close the handle.

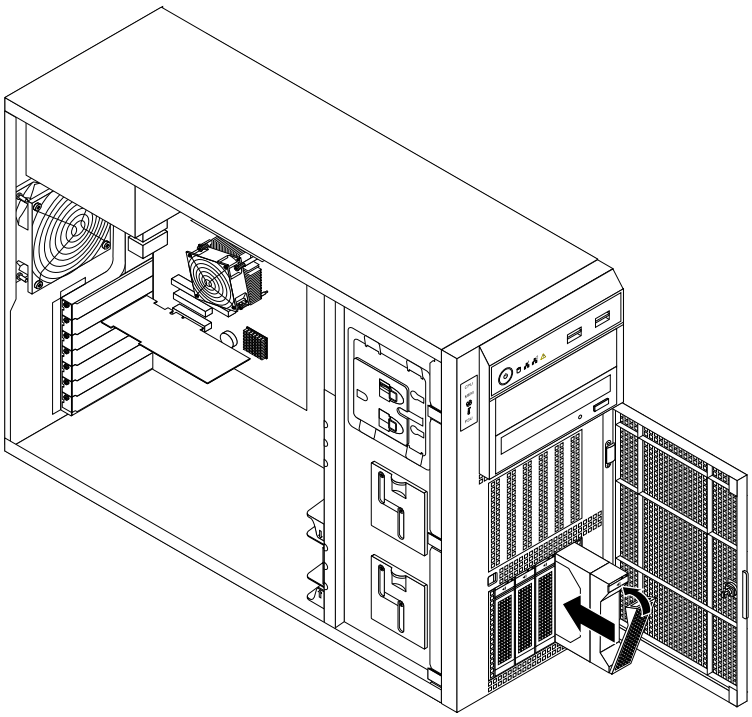


Figure 61. Installing the hot-swap hard disk drive

7. Check the hot-swap hard disk drive status LEDs to make sure that the hard disk drive is operating correctly. You might have to restart the server for the newly installed drive to be recognized. See "Hot-swap hard disk drive status LEDs" on page 32. If the hard disk drive is faulty, you need to reinstall or replace it until it is operating correctly.
8. Close and lock the front door.
9. Do one of the following:
   - If you are installing a hot-swap hard disk drive, save the removed hard disk drive dummy tray in the event that you later remove the hot-swap hard disk drive and need a dummy tray to cover the drive bay.
   - If you are replacing a hot-swap hard disk drive and are instructed to return the old hot-swap hard disk drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To configure RAID, go to "Configuring RAID" on page 71.

Removing or installing a non-hot-swap hard disk drive

This topic provides instructions on how to remove or install a non-hot-swap hard disk drive.

This topic applies only to server models that have non-hot-swap hard disk drive(s) installed. See "Features" on page 7 for more information about the supported non-hot-swap hard disk drives.

For a list of the ThinkServer hard disk drive options, go to http://www.lenovo.com/thinkserver. Click the **Products** tab and then click **Options → ThinkServer Hard Drives** to view the information.

Removing a non-hot-swap hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to remove a non-hot-swap hard disk drive.

Before you begin, consider the following hard disk drive installation rules:

- Follow the order of the hard disk drive bays when installing a hard disk drive. See "Server components" on page 25 to locate the hard disk drive bays in your server.
- For RAID configuration, the hard disk drives must be the same type with the same capacity if they are within a single RAID array. For more information, see "Configuring RAID" on page 71.
- For hard disk drives with different capacities, install the hard disk drive with the lowest capacity first.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To remove a non-hot-swap hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Use the front door key to unlock the front door and then use the front door handle **1** to pivot the front door to the open position.

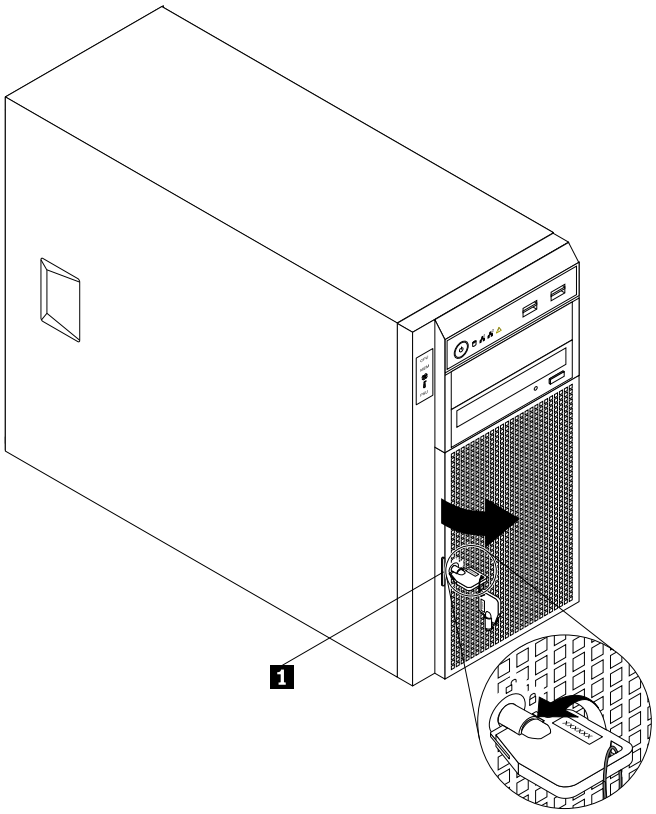


Figure 62. Opening the front door of the server

3. The non-hot-swap hard disk drive(s) are installed in the lower hard disk drive cage and are protected by an EMI-protective panel. Press the small tab **1** on the EMI-protective panel from the bottom and then pivot the EMI-protective panel upward to remove it from the chassis and gain access to the non-hot-swap hard disk drive(s).

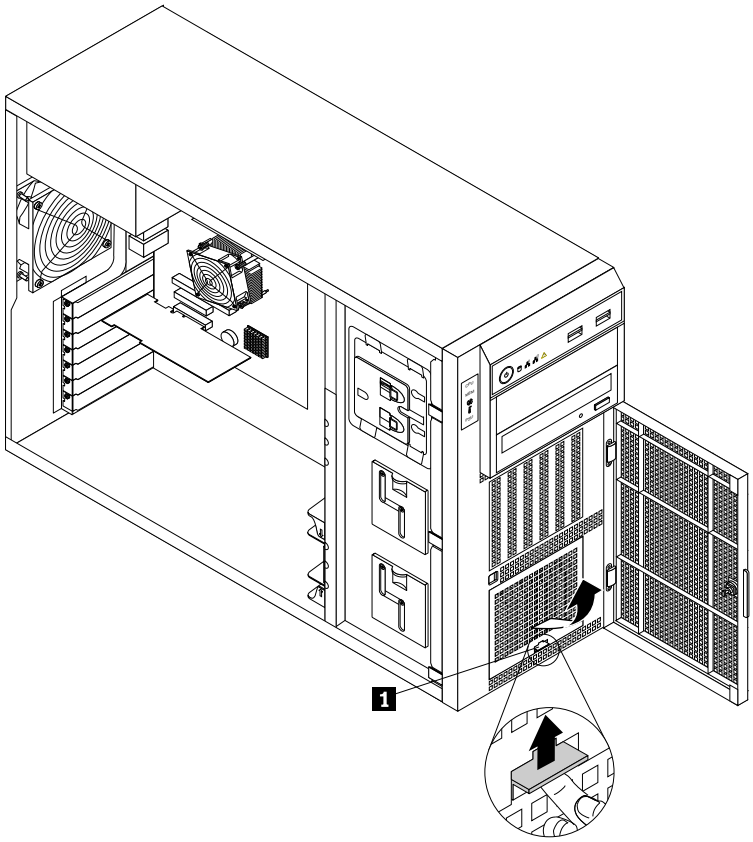


Figure 63. Removing the EMI-protective panel

4. Remove the server cover. See “Removing the server cover” on page 85.
5. Remove the front system fan 1. See “Replacing the front system fan” on page 149.
6. Locate the appropriate non-hot-swap hard disk drive. See “Server components” on page 25. Then, disconnect the SATA signal cable and the power cable from the rear of the non-hot-swap hard disk drive.

7. Insert two fingers into the holes in the two tabs on the front of the blue bracket. Then, press the tabs towards each other and carefully slide the non-hot-swap hard disk drive out of the front of the chassis.

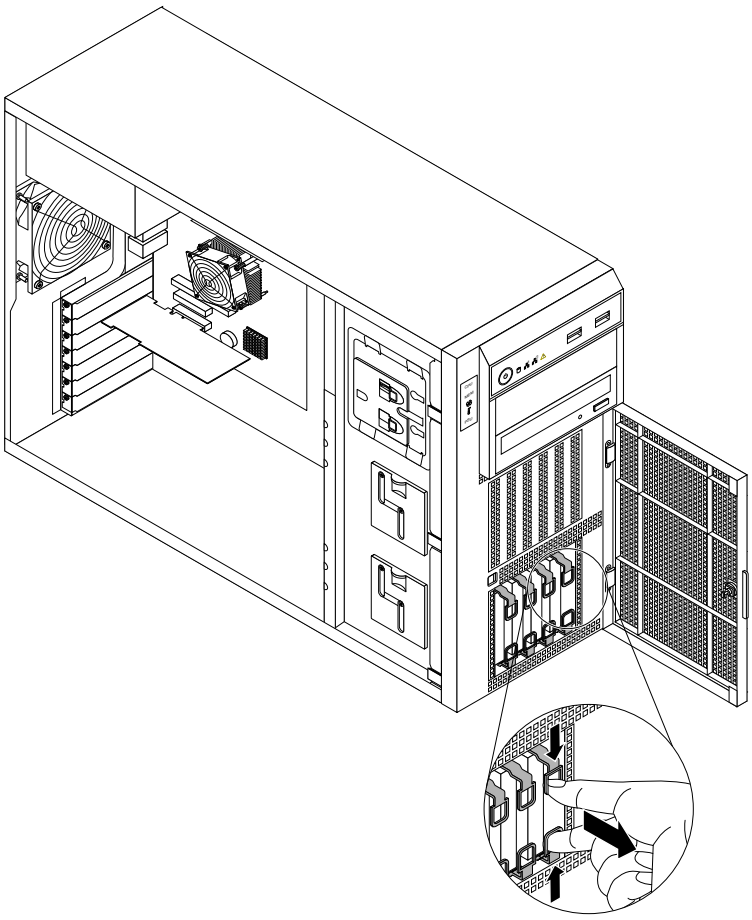


Figure 64. Sliding the non-hot-swap hard disk drive out of the bay

8. Flex the sides of the blue bracket to remove the non-hot-swap hard disk drive from the bracket. Save the bracket for future use.

   Note: Do not touch the circuit board on the hard disk drive.

9. Reinstall the front system fan 1. See “Replacing the front system fan” on page 149.

10. Align the top edge of the EMI-protective panel with the top side of the hard disk drive cage and then pivot the EMI-protective panel down until it snaps into position.

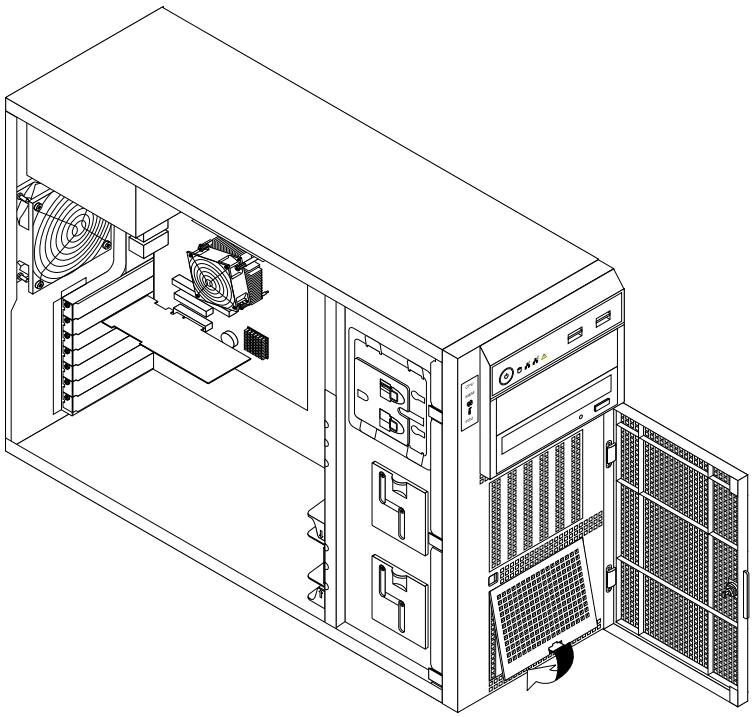


Figure 65. Installing the EMI-protective panel

11. Disconnect the SATA cable for the removed non-hot-swap hard disk drive from the system board and save the cable for future use.
12. Close and lock the front door.
13. If you are instructed to return the old non-hot-swap hard disk drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 162. Then, you might need to reconfigure RAID for your server. See "Configuring RAID" on page 71.

Installing a non-hot-swap hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to install a non-hot-swap hard disk drive.

Before you begin, consider the following hard disk drive installation rules:

- Follow the order of the hard disk drive bays when installing a hard disk drive. See "Server components" on page 25 to locate the hard disk drive bays in your server.
- For RAID configuration, the hard disk drives must be the same type with the same capacity if they are within a single RAID array. For more information, see "Configuring RAID" on page 71.

- For hard disk drives with different capacities, install the hard disk drive with the lowest capacity first.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Depending on the model, your server might look slightly different from the illustrations in this topic.
- Use any documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this topic.

To install a non-hot-swap hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Use the front door key to unlock the front door and then use the front door handle **1** to pivot the front door to the open position.

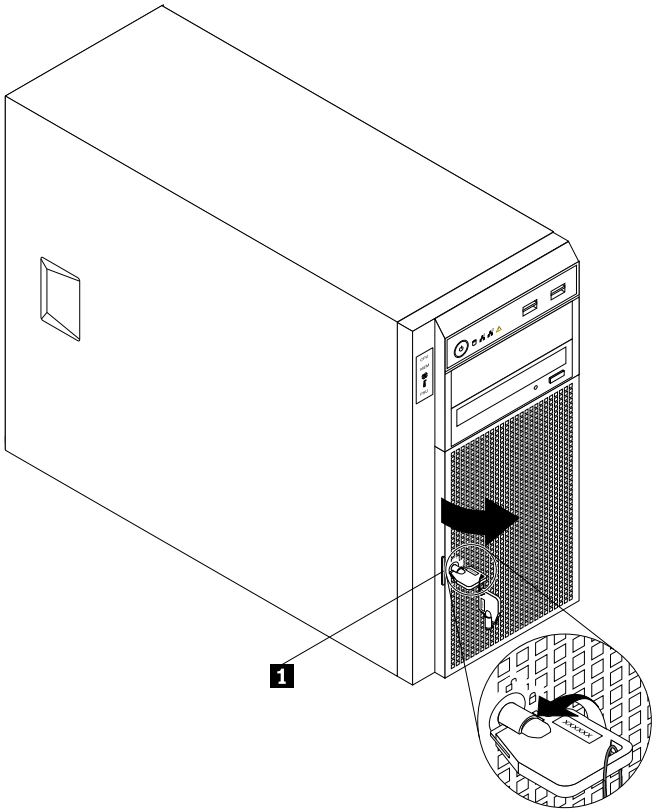


Figure 66. Opening the front door of the server

3. The non-hot-swap hard disk drive(s) are installed in the lower hard disk drive cage and are protected by an EMI-protective panel. Press the small tab **1** on the EMI-protective panel from the bottom and then pivot the EMI-protective panel upward to remove it from the chassis and gain access to the non-hot-swap hard disk drive bays.

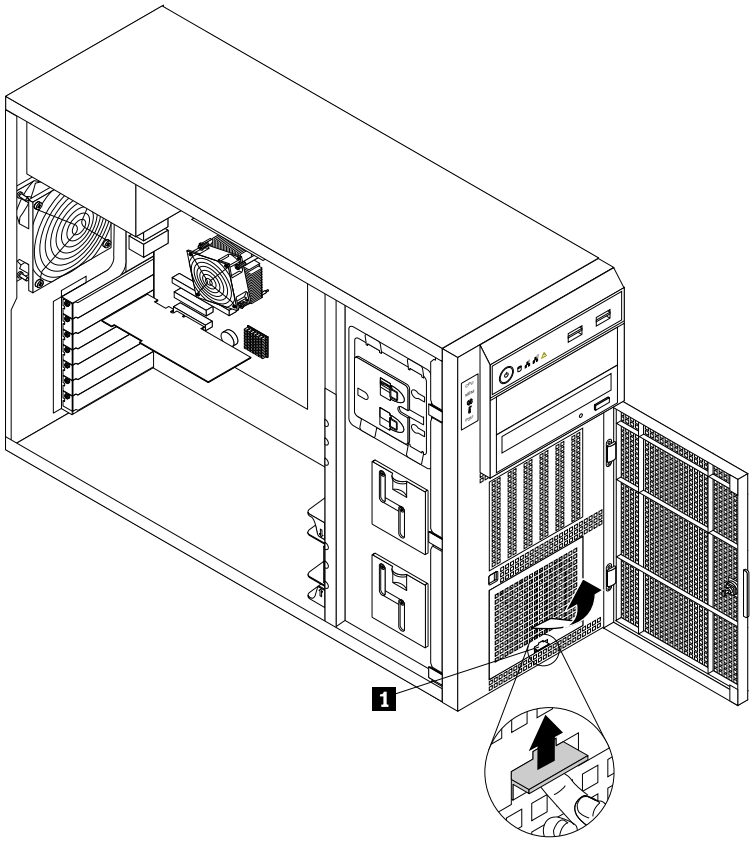


Figure 67. Removing the EMI-protective panel

4. Remove the server cover. See “Removing the server cover” on page 85.
5. Remove the front system fan 1. See “Replacing the front system fan” on page 149.
6. Locate the appropriate non-hot-swap hard disk drive bay. See “Server components” on page 25.
7. Touch the static-protective package that contains the new non-hot-swap hard disk drive to any unpainted surface on the outside of the server. Then, take the new non-hot-swap hard disk drive and the signal cable out of the package.

   Note: Do not touch the circuit board on the hard disk drive.

8. Install the new non-hot-swap hard disk drive into a blue bracket by flexing the sides of the bracket and aligning pin 1, pin 2, pin 4, and pin 5 on the bracket with the corresponding holes in the hard disk drive so that the hard disk drive can be seated in the bracket.

   Note: Do not touch the circuit board 3 on the bottom of the hard disk drive.

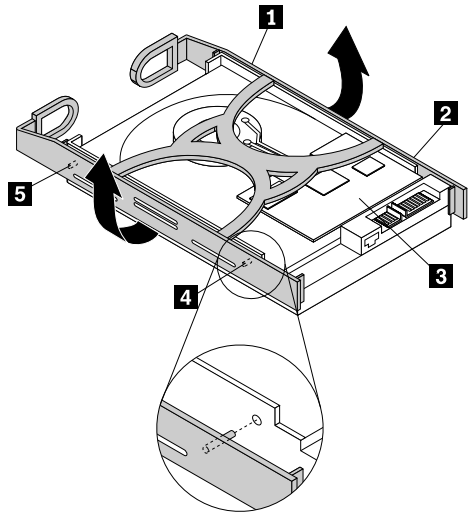


Figure 68. Installing the non-hot-swap hard disk drive into the bracket

9. Slide the new non-hot-swap hard disk drive with bracket into the drive bay until it snaps into position.

10. Connect the appropriate power cable 1 and the SATA signal cable 2 to the rear of the non-hot-swap hard disk drive.

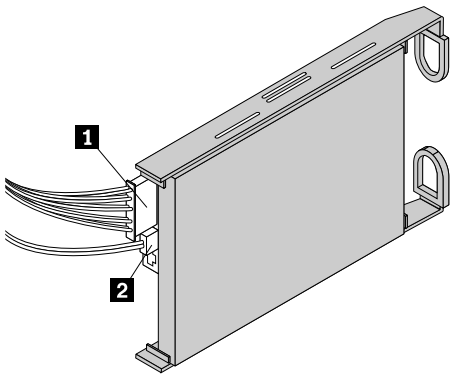


Figure 69. Connecting cables to the rear of the non-hot-swap hard disk drive

The following table provides information about the recommended power connector and system board SATA connector for the non-hot-swap hard disk drive installed in each drive bay. See “Server components” on page 25 and “System board components” on page 42 for the location information about the hard disk drive bays and SATA connectors on the system board.

Non-hot-swap hard disk drive	Power connector	System board SATA connector
Installed in bay 0	P9 power connector	SATA connector 0
Installed in bay 1	P10 power connector	SATA connector 1
Installed in bay 2	P7 power connector	SATA connector 2
Installed in bay 3	P8 power connector	SATA connector 3

11. Connect the other end of the SATA signal cable to the appropriate SATA connector on the system board. See “System board components” on page 42.
12. Reinstall the front system fan 1. See “Replacing the front system fan” on page 149.

13. Align the top edge of the EMI-protective panel with the top side of the hard disk drive cage and then pivot the EMI-protective panel down until it snaps into position.

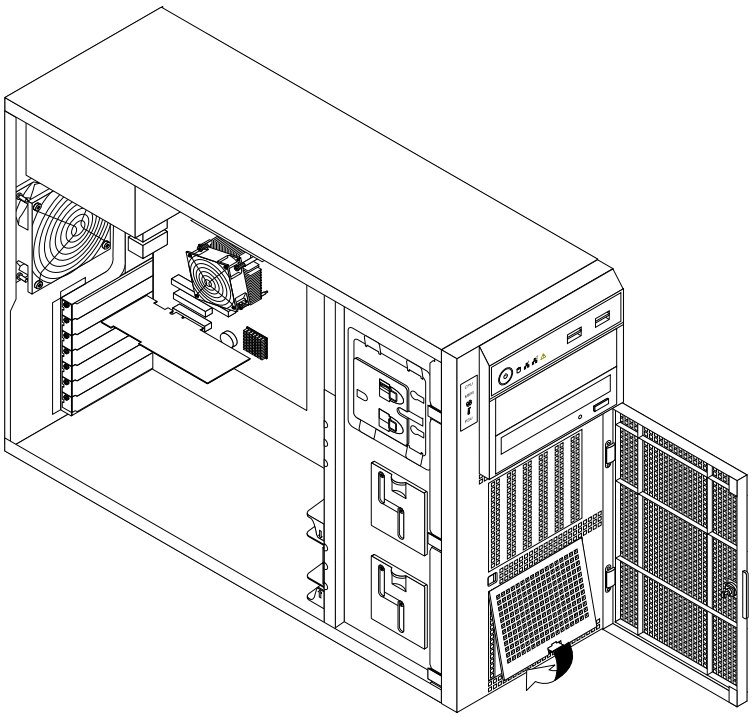


Figure 70. Installing the EMI-protective panel

14. Close and lock the front door.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 162. Then, you might need to reconfigure RAID for your server. See "Configuring RAID" on page 71.

Replacing the hot-swap hard disk drive backplane

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to replace the hot-swap hard disk drive backplane.

This topic applies only to server models that have hot-swap hard disk drive(s) installed.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the hot-swap hard disk drive backplane, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See “Removing the server cover” on page 85.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 87.
4. Locate the hot-swap hard disk drive backplane(s). See “Hot-swap hard disk drive backplane” on page 34.
5. Remove the front system fan. See “Replacing the front system fan” on page 149.
6. Remove all the installed hot-swap hard disk drives and dummy trays (if any) from the hard disk drive cage. See “Installing or replacing a hot-swap hard disk drive” on page 119.
7. Note down the cable connections on the backplane and then disconnect all the cables from the backplane.
8. Lift the release latch **1** and slide the hard disk drive cage out of the front of the chassis.

   Note: The following illustration shows the 3.5-inch hard disk drive cage. For the 2.5-inch hard disk drive cage, the removal procedure is the same.

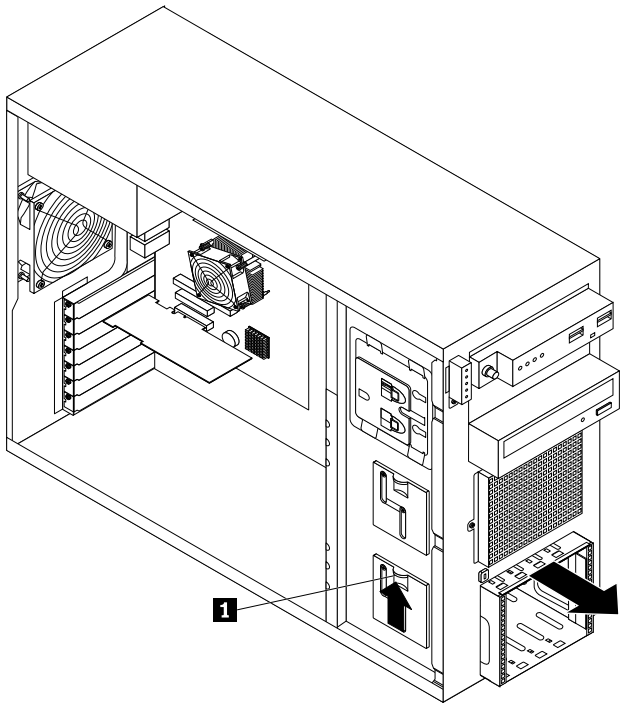


Figure 71. Removing the hard disk drive cage

9. Depending on whether your server has a 2.5-inch hot-swap hard disk drive cage with backplane or 3.5-inch hot-swap hard disk drive cage(s) with backplane(s), do one of the following:

- For the 3.5-inch hot-swap hard disk drive backplane, remove the four screws that secure the backplane and then remove the backplane from the hard disk drive cage.

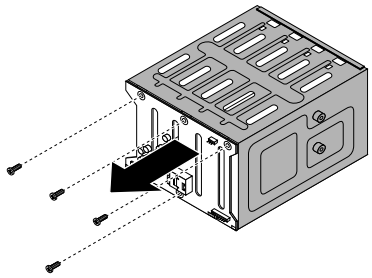


Figure 72. Removing the 3.5-inch hot-swap hard disk drive backplane

- For the 2.5-inch hot-swap hard disk drive backplane, remove the six screws that secure the backplane and then remove the backplane from the hard disk drive cage.

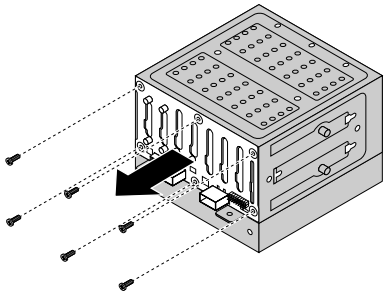


Figure 73. Removing the 2.5-inch hot-swap hard disk drive backplane

10. Touch the static-protective package that contains the new hot-swap hard disk drive backplane to any unpainted surface on the outside of the server. Then, remove the new backplane from the package.

    Note: Carefully handle the backplane by its edges.

11. Position the new backplane on the hard disk drive cage so that the screw holes in the new backplane are aligned with the corresponding holes in the hard disk drive cage. Then, do one of the following depending on the hard disk drive cage:

    - For the 3.5-inch hot-swap hard disk drive cage, install the four screws to secure the backplane on the cage.

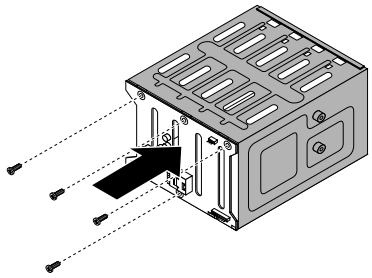


Figure 74. Installing the 3.5-inch hot-swap hard disk drive backplane

- For the 2.5-inch hot-swap hard disk drive cage, install the six screws to secure the backplane on the cage.

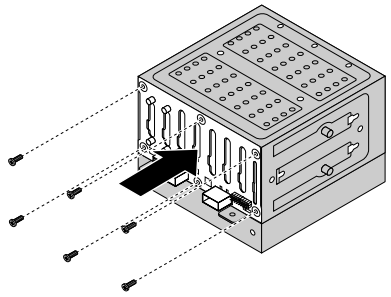


Figure 75. Installing the 2.5-inch hot-swap hard disk drive backplane

12. Slide the hard disk drive cage into the chassis from the front until it snaps into position.

    Note: The following illustration shows the 3.5-inch hard disk drive cage. For the 2.5-inch hard disk drive cage, the installation procedure is the same.

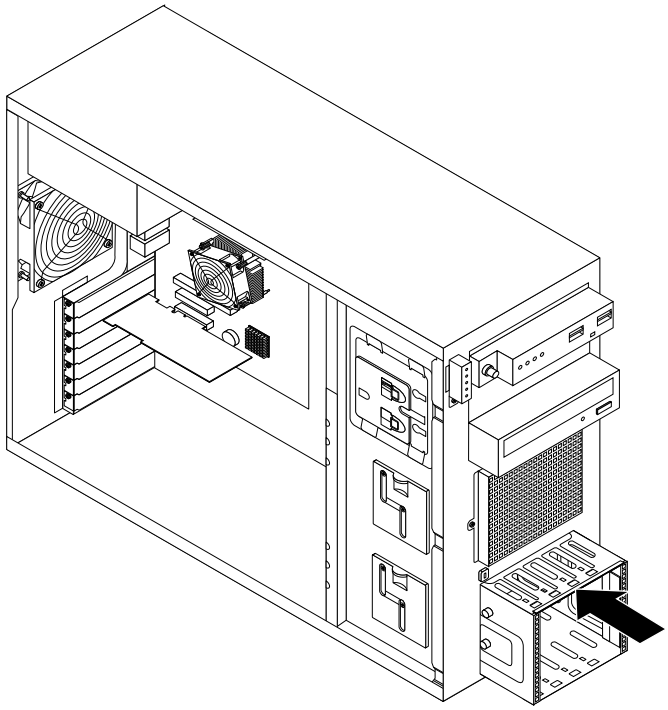


Figure 76. Installing the hard disk drive cage

13. Reinstall all the hot-swap hard disk drives and dummy trays (if any) in the hard disk drive cage. See “Installing or replacing a hot-swap hard disk drive” on page 119.
14. Refer to your note and reconnect the cables to the backplane.
15. Reinstall the front system fan. See “Replacing the front system fan” on page 149.
16. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 87.

17. If you are instructed to return the old hot-swap hard disk drive backplane, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 162.

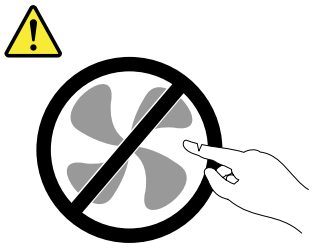
Replacing the non-hot-swap power supply assembly

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to replace the non-hot-swap power supply assembly.

This topic applies only to server models that come with a non-hot-swap power supply assembly.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the non-hot-swap power supply assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Remove the front system fan(s). See “Replacing the front system fan” on page 149.

5. Note down the cable routing and connection. Then, disconnect the power supply assembly cables from the system board and all drives. For server models with hot-swap hard disk drives, you also need to disconnect the power cable(s) from the hot-swap hard disk drive backplane(s).
6. Release the power supply assembly cables from the cable clips and ties in the chassis.
7. Remove the four screws **1** at the rear of the chassis that secure the power supply assembly. Then, push the power supply assembly from the rear until it is released from the metal retaining tab **2**.

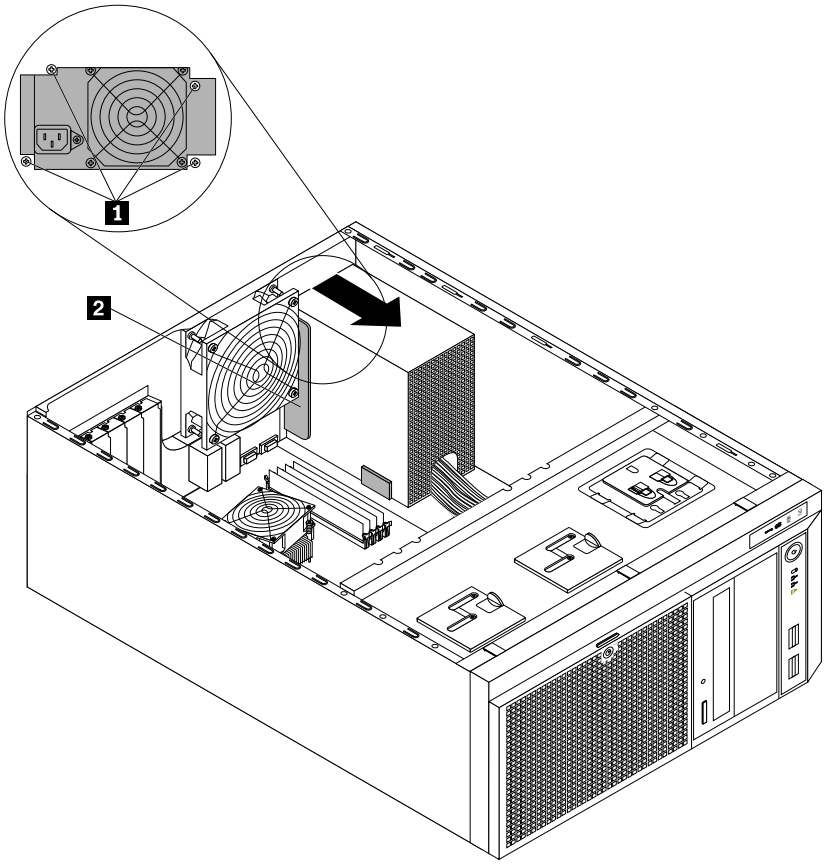


Figure 77. Releasing the non-hot-swap power supply assembly

8. Pivot the power supply assembly a little bit in the direction as shown and then lift it out of the chassis.

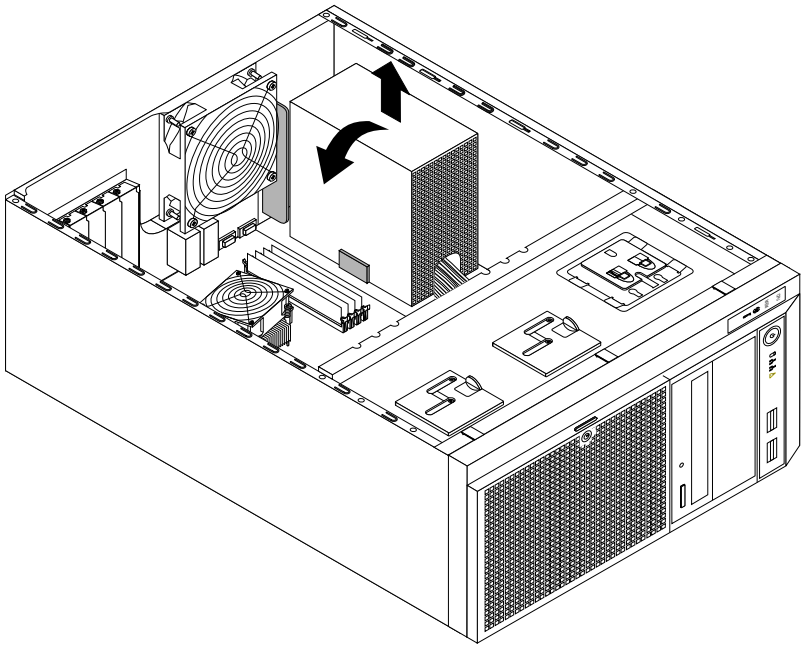


Figure 78. Removing the non-hot-swap power supply assembly

9. Touch the static-protective package that contains the new power supply assembly to any unpainted surface on the outside of the server. Then, remove the new power supply assembly from the package and ensure that the new power supply assembly is the correct replacement. See “Features” on page 7 for information about the supported power supply assemblies.

10. Install the new power supply assembly into the chassis so that the four screw holes in the new power supply assembly are aligned with the corresponding holes marked with A in the rear of the chassis. Then, install the four screws 1 to secure the new power supply assembly in place.

    Note: Use only screws provided by Lenovo.

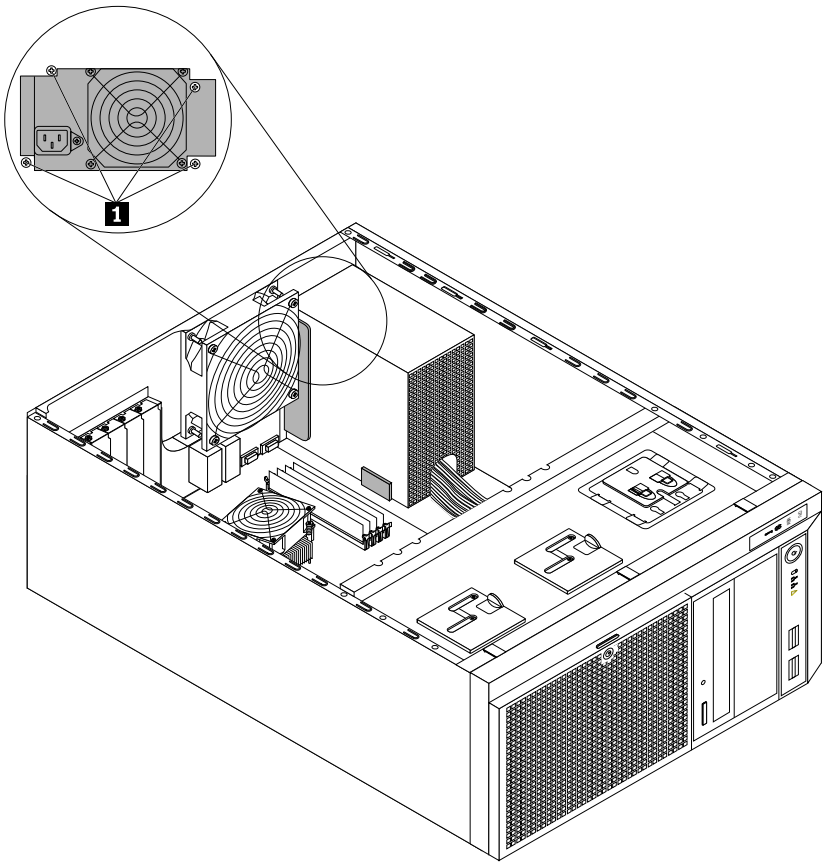


Figure 79. Installing the non-hot-swap power supply assembly

11. Refer to your note and connect the new power supply assembly cables to the system board, all drives, and or hot-swap hard disk drive backplane(s), depending on the model. Then, properly route the cables and secure the cables with the cable clips and ties in the chassis.
12. Reinstall the front system fan(s). See “Replacing the front system fan” on page 149.
13. If you are instructed to return the old non-hot-swap power supply assembly, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 162.

Replacing a hot-swap redundant power supply module

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to replace a hot-swap redundant power supply module.

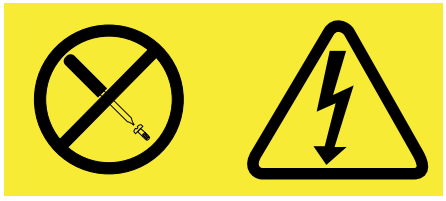
This topic applies only to server models that come with hot-swap redundant power supply module(s). For each hot-swap redundant power supply module, there might be one or two status LEDs on the power supply module near the power cord connector. When the green LED is lit, it indicates that the hot-swap redundant power supply module is working properly. When the red LED is lit, it indicates that the hot-swap redundant power supply module has failed.

The hot-swap redundant power supply modules help you avoid significant interruption to the operation of the system when a power supply module fails and you can replace a hot-swap redundant power supply module without turning off the server.

Note: To maintain the EMI integrity and cooling of the server, install a new hot-swap redundant power supply module as soon as you remove the failing one or cover the other bay with a shield if you just use one module to provide power.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. Your hot-swap redundant power supply module might look slightly different from the illustrations in this topic.
2. Use any documentation that comes with the new hot-swap redundant power supply module and follow those instructions in addition to the instructions in this topic.

To replace a hot-swap redundant power supply module, do the following:

1. Locate the failing hot-swap redundant power supply module on the rear of your server. Then, press the release tab **1** in the direction as shown and carefully pull the handle **2** at the same time to slide the redundant power supply module out of the chassis.

   Note: Do not use too much strength. You can first carefully slide the redundant power supply module a little bit out to release it from the secured position. Then, completely slide it out of the chassis.

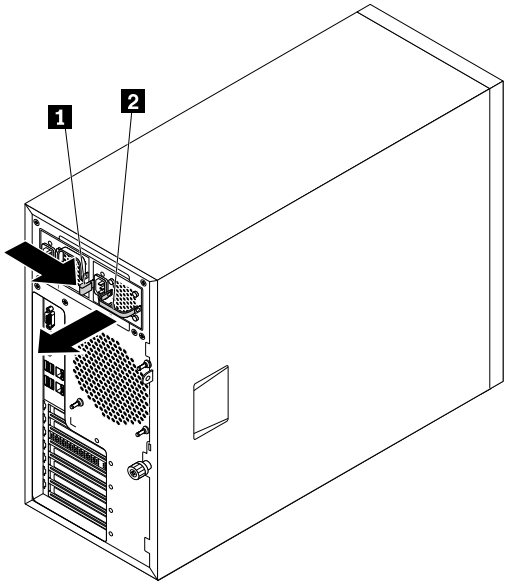


Figure 80. Removing a hot-swap redundant power supply module

2. Touch the static-protective package that contains the new hot-swap redundant power supply module to any unpainted surface on the outside of the server. Then, remove the new hot-swap redundant power supply module from the package.

3. Note the orientation of the hot-swap redundant power supply module and then slide the new hot-swap redundant power supply module into the chassis until it snaps into position.

   Note: If your server comes with one hot-swap redundant power supply module installed in the redundant power supply module bay 1 (the bay number is marked on the rear of the chassis) and you are installing a secondary hot-swap redundant power supply module to provide redundant power, you need to remove the shield that protects the bay 2 first. Save the shield for future use.

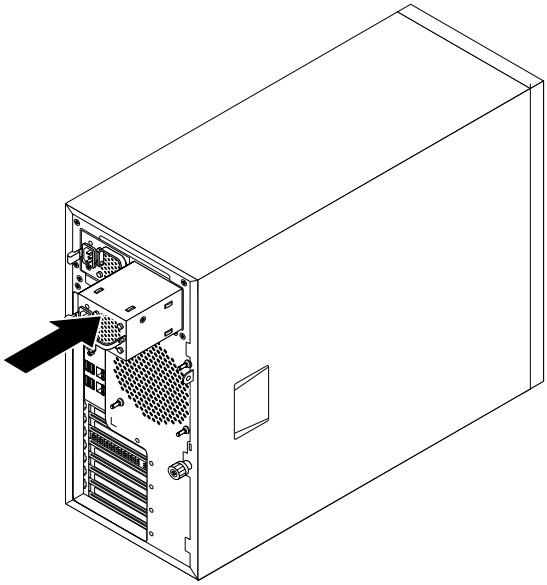


Figure 81. Installing a hot-swap redundant power supply module

4. If you are instructed to return the old hot-swap redundant power supply module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.
5. To work with another piece of hardware, go to the appropriate section.

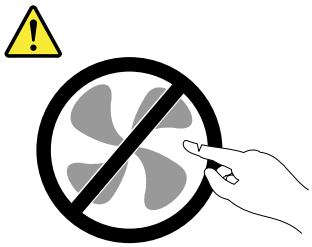
Replacing the power distribution board and cage assembly

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to replace the power distribution board and cage assembly.

This topic applies only to server models that come with hot-swap redundant power supply modules.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the power distribution board and cage assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the hot-swap redundant power supply module(s). See “Replacing a hot-swap redundant power supply module” on page 140.

   Note: If your server comes with one hot-swap redundant power supply module installed in the redundant power supply module bay 1 (the bay number is marked on the rear of the chassis), there is a shied installed on bay 2 to protect the empty bay. Remove the shield and save it for future use.
3. Remove the server cover. See “Removing the server cover” on page 85.
4. Lay the server on its side for easier operation.
5. Remove the front system fan(s). See “Replacing the front system fan” on page 149.
6. Note down the cable routing and connection. Then, disconnect the power cables of the power distribution board and cage assembly from the system board and all drives. For server models with hot-swap hard disk drives, you also need to disconnect the power cable(s) from the hot-swap hard disk drive backplane(s).
7. Release the power cables of the power distribution board and cage assembly from the cable clips and ties in the chassis.

8. Remove the four screws 1 at the rear of the chassis and the two screws 2 on the metal clip at the front of the power distribution board and cage assembly. Then, push the power distribution board and cage assembly from the rear until it is released from the metal retaining tab 3 and then carefully lift it out of the chassis.

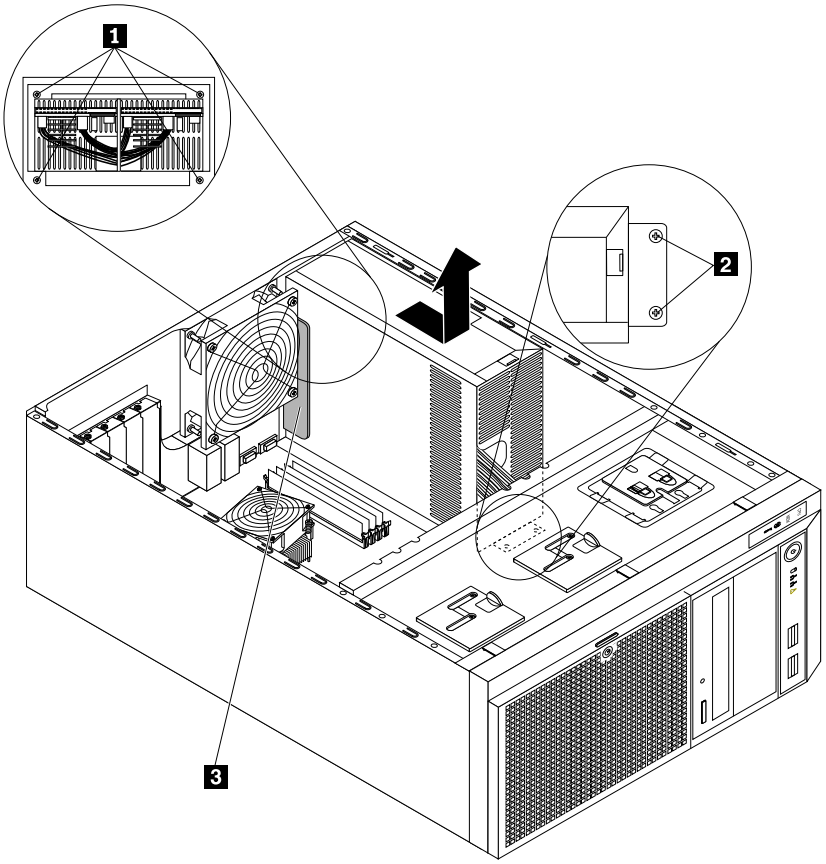


Figure 82. Removing the power distribution board and cage assembly

9. Touch the static-protective package that contains the new power distribution board and cage assembly to any unpainted surface on the outside of the server. Then, remove the new power distribution board and cage assembly from the package.

10. Install the new power distribution board and cage assembly into the chassis so that the four screw holes 1 in the rear of the new power distribution board and cage assembly are aligned with the corresponding holes marked with R in the rear of the chassis. Meanwhile, make sure that the two screw holes 2 in the metal clip at the front of the new power distribution board and cage assembly are aligned with the corresponding holes in the chassis. Then, install the four screws 1 and the two screws 2 to secure the new power distribution board and cage assembly in place.

    Note: Use only screws provided by Lenovo.

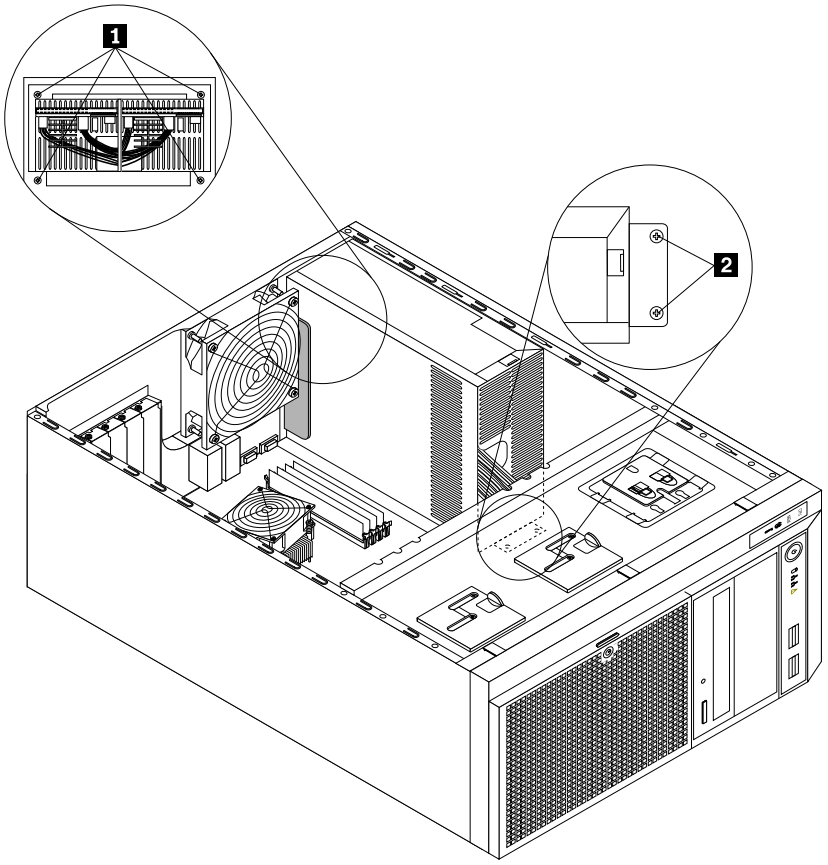


Figure 83. Installing the power distribution board and cage assembly

11. Refer to your note and connect the power cables of the new power distribution board and cage assembly to the system board, all drives, and or hot-swap hard disk drive backplane(s), depending on the model. Then, properly route the cables and secure the cables with the cable clips and ties in the chassis.
12. Reinstall the front system fan(s). See “Replacing the front system fan” on page 149.
13. Reinstall the hot-swap redundant power supply module(s) and or the protective shield for the redundant power supply module bay 2. See “Replacing a hot-swap redundant power supply module” on page 140.
14. If you are instructed to return the old power distribution board and cage assembly, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 162.

Replacing the front panel board assembly

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to replace the front panel board assembly.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the front panel board assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 87.
4. Locate the front panel. See “Front panel” on page 17.
5. Remove the front system fan(s). See “Replacing the front system fan” on page 149.
6. Disconnect the signal cables of the front panel board assembly from the internal dual-port USB 2.0 connector 1 and the front panel connector on the system board. See “System board components” on page 42.
7. If necessary, remove any parts or disconnect any cables that might impede your access to the signal cables of the front panel board assembly. Note down the cable routing and then release the signal cables of the front panel board assembly from any cable clips or ties in the chassis.

8. Remove the screw **1** on the chassis that secures the front panel board assembly. Then, carefully remove the front panel board assembly from the chassis and pull the signal cables of the front panel board assembly out of the chassis.

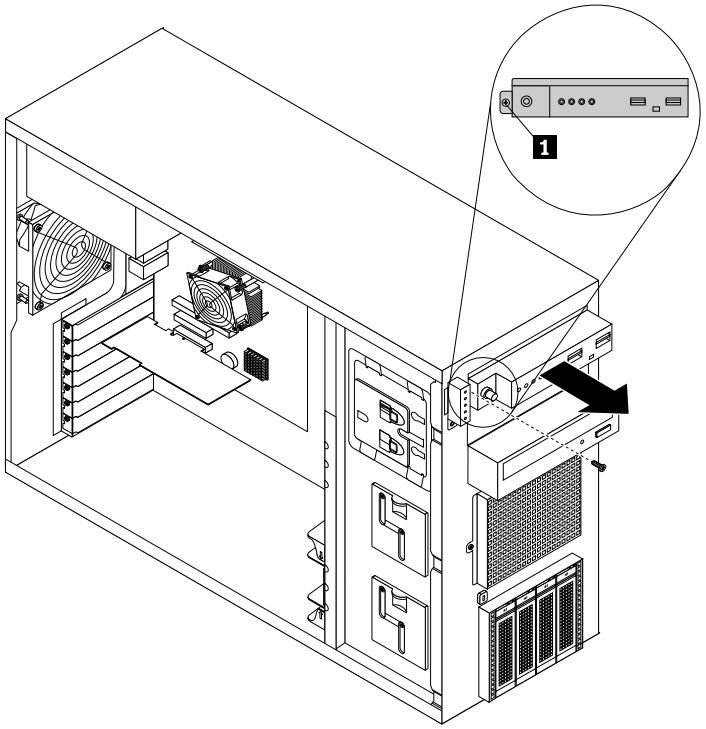


Figure 84. Removing the front panel board assembly

9. Touch the static-protective package that contains the new front panel board assembly to any unpainted surface on the outside of the server. Then, take the new front panel board assembly out of the package.
10. Note the cable connection. Then, disconnect the signal cables from the rear of the old front panel board assembly and connect them to the rear of the new one.

11. Route the signal cables of the new front panel board assembly through the corresponding hole in the chassis and position the new front panel board assembly on the chassis so that the screw hole in it is aligned with the corresponding screw hole 1 in the chassis. Then, install the screw to secure the front panel board assembly in place.

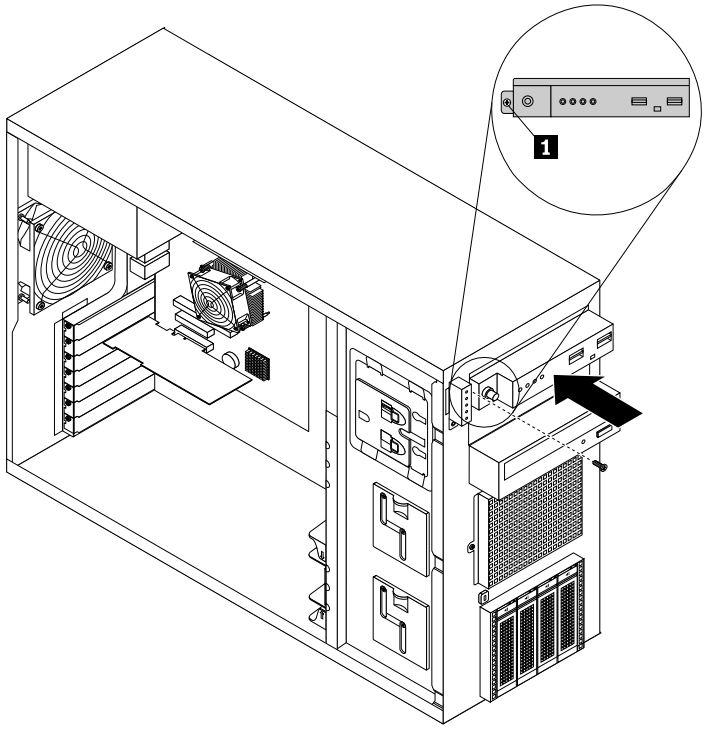


Figure 85. Installing the front panel board assembly

12. Connect the front panel USB cable to the internal dual-port USB 2.0 connector 1 on the system board. Then, connect the front panel cable to the front panel connector on the system board. See "System board components" on page 42.
13. Properly route the signal cables of the new front panel board assembly according to your note. You might need to secure the signal cables with cable clips or ties in the chassis.
14. Reinstall the front system fan(s). See "Replacing the front system fan" on page 149.
15. Reinstall the front bezel. See "Removing and reinstalling the front bezel" on page 87.
16. If you are instructed to return the old front panel board assembly, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 162.

Replacing the front system fan

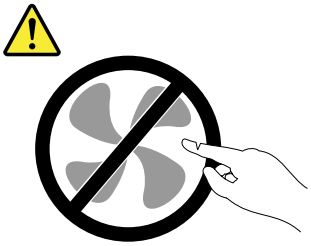
Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to replace the front system fan.

Depending on the model, your server might come with one or two front system fans. See “Server components” on page 25 to locate the front system fan(s) installed in your server model.

Note: The front system fan 2 is only available in server models with five to eight 3.5-inch hot-swap hard disk drives installed. The front system fan 2 should only be factory-installed. Lenovo does not support users and servicers to install a secondary front system fan by themselves.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the front system fan, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Locate the front system fan 1. See “Server components” on page 25.
4. Disconnect the front system fan 1 cable from the 4-pin system fan 1 connector on the system board. See “System board components” on page 42.

5. Press the two tabs of the front system fan towards each other until the two tips 1 are aligned with the corresponding holes in the chassis. Then, carefully slide the front system fan out of the chassis.

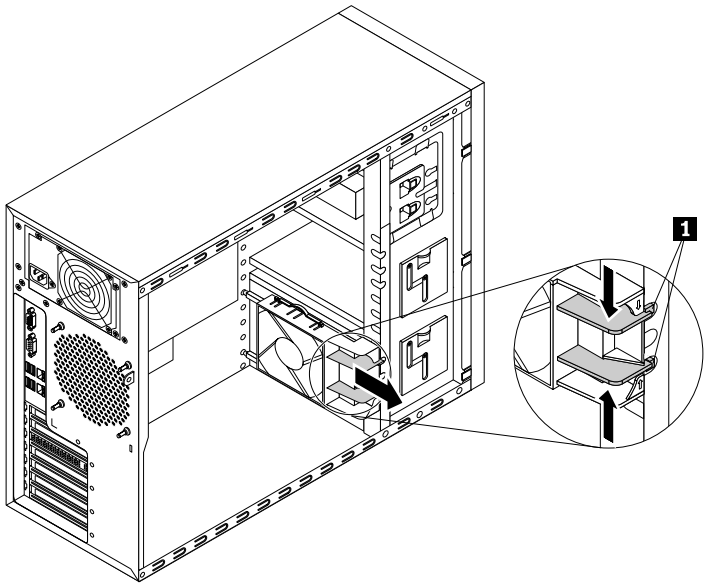


Figure 86. Removing the front system fan

6. Touch the static-protective package that contains the new front system fan to any unpainted surface on the outside of the server. Then, remove the new front system fan from the package.
7. Position the new front system fan on the system fan 1 mounting area of the chassis so that the three tips 1 on the bottom of the front system fan are aligned with the corresponding holes in the mounting area. Meanwhile, make sure that the two posts 2 of the front system fan are aligned with the corresponding holes in the inner side of the chassis. Then, carefully slide the front system fan into the chassis until it snaps into position.

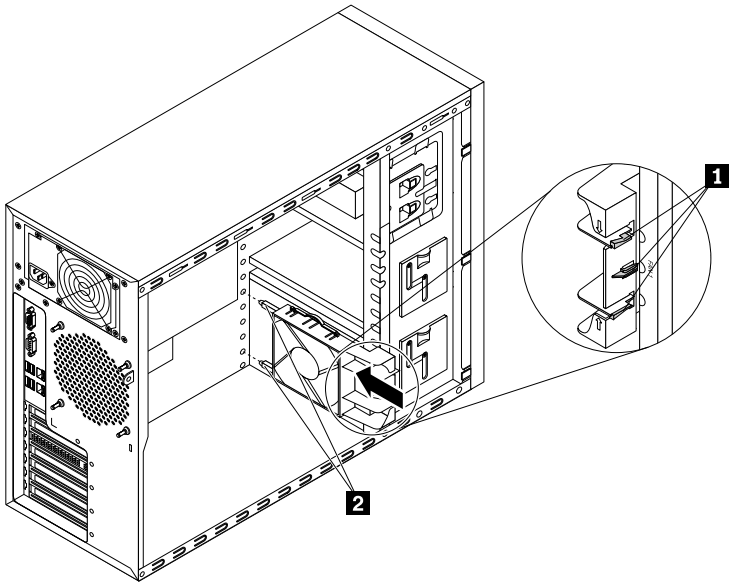


Figure 87. Installing the front system fan

8. Connect the new front system fan cable to the 4-pin system fan 1 connector on the system board. See “System board components” on page 42.

   Note: For server models with five to eight 3.5-inch hot-swap hard disk drives, there is a secondary front system fan installed in the front system fan 2 mounting area (above the front system fan 1 mounting area). The cable of the secondary front system fan is connected to the 5-pin system fan 2 connector on the system board. See “System board components” on page 42.
9. If you are instructed to return the old front system fan, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

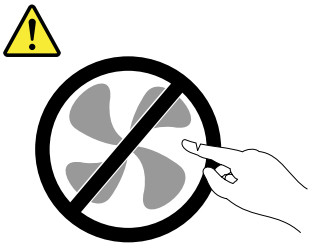
- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 162.

Replacing the rear system fan

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to replace the rear system fan.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the rear system fan, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Locate the rear system fan. See “Server components” on page 25.
4. Disconnect the rear system fan cable from the system fan 3 connector on the system board. See “System board components” on page 42.

5. The rear system fan is attached to the chassis by four rubber mounts. Remove the rear system fan by cutting the rubber mounts and pulling the rear system fan out of the chassis.

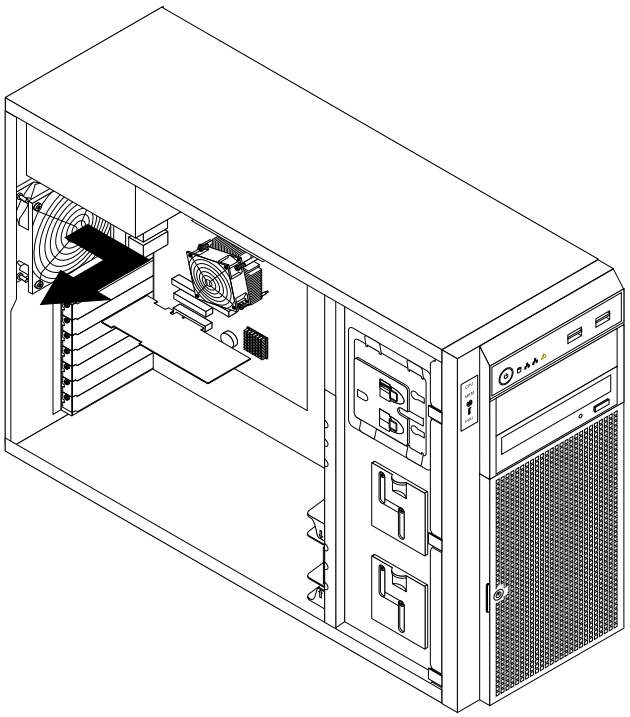


Figure 88. Removing the rear system fan

6. Touch the static-protective package that contains the new rear system fan to any unpainted surface on the outside of the server. Then, remove the new rear system fan from the package.

7. Position the new rear system fan, which has four new rubber mounts attached, on the chassis so that the four new rubber mounts are aligned with the corresponding holes in the chassis. Push the rubber mounts through the holes and then pull on the tips of the rubber mounts from the other side of the chassis until the rear system fan is secured in place.

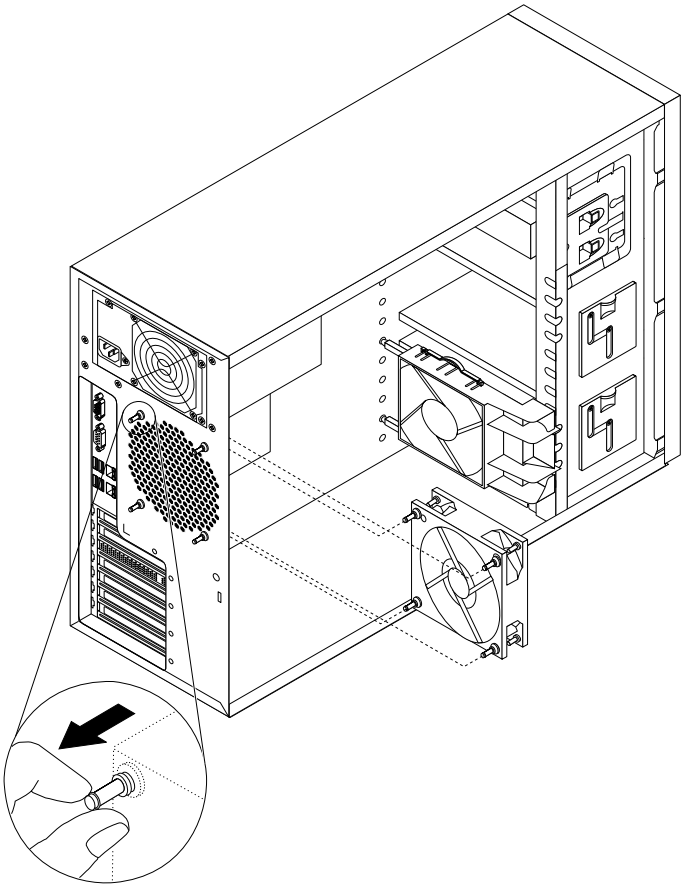


Figure 89. Installing the rear system fan

8. Connect the new rear system fan cable to the system fan 3 connector on the system board. See "System board components" on page 42.
9. If you are instructed to return the old rear system fan, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

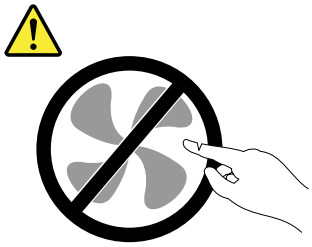
- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 162.

Replacing the heat sink and fan assembly

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to replace the heat sink and fan assembly.

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



CAUTION:

The heat sink and fan assembly might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To replace the heat sink and fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Locate the heat sink and fan assembly. See “Server components” on page 25.
4. Lay the server on its side for easier operation. If necessary, remove any installed PCI card that might impede your access to the heat sink and fan assembly. See “Removing a PCI card” on page 95.
5. Disconnect the heat sink and fan assembly cable from the microprocessor fan connector on the system board. See “System board components” on page 42.

6. Remove the four screws that secure the heat sink and fan assembly to the system board. It is recommended that you carefully remove the four screws from the system board using the following method to avoid any possible damage to the system board.
   a. Partially remove screw 1, then completely remove screw 3, and then return to screw 1 and completely remove it.
   b. Partially remove screw 2, then completely remove screw 4, and then return to screw 2 and completely remove it.

   Note: The four screws are integrated parts of the heat sink and fan assembly. Do not try to remove the four screws from the heat sink and fan assembly.

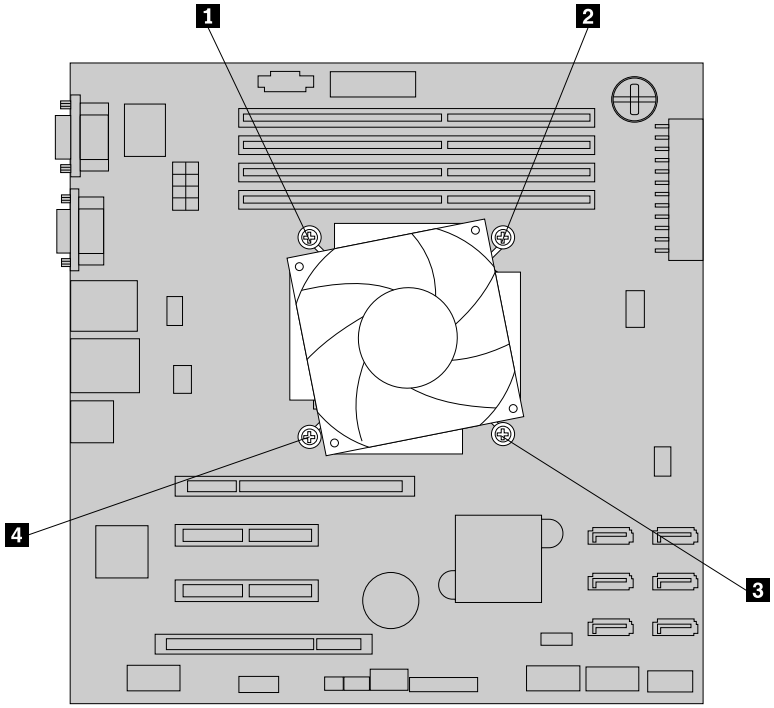


Figure 90. Removing the screws that secure the heat sink and fan assembly

7. Gently twist the heat sink and fan assembly to free it from the microprocessor and then lift the heat sink and fan assembly off the system board.
8. Lay aside the old heat sink and fan assembly. Touch the static-protective package that contains the new heat sink and fan assembly to any unpainted surface on the outside of the server. Then, remove the new heat sink and fan assembly from the package.

   Note: When handling the heat sink and fan assembly, do not touch the thermal grease on the bottom of it.
9. Place the new heat sink and fan assembly on the system board so that the four screws on the new heat sink and fan assembly are aligned with the corresponding mounting studs on the system board. Note the orientation of the new heat sink and fan assembly and make sure that you properly place it so that you can easily connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board. See “System board components” on page 42.

10. Install the four screws to secure the new heat sink and fan assembly on the system board. It is recommended that you carefully install the four screws using the following method to avoid any possible damage to the system board.
    a. Partially tighten screw 1, then firmly tighten screw 3, and then return to screw 1 and firmly tighten it. Do not over-tighten the screws.
    b. Partially tighten screw 2, then firmly tighten screw 4, and then return to screw 2 and firmly tighten it. Do not over-tighten the screws.

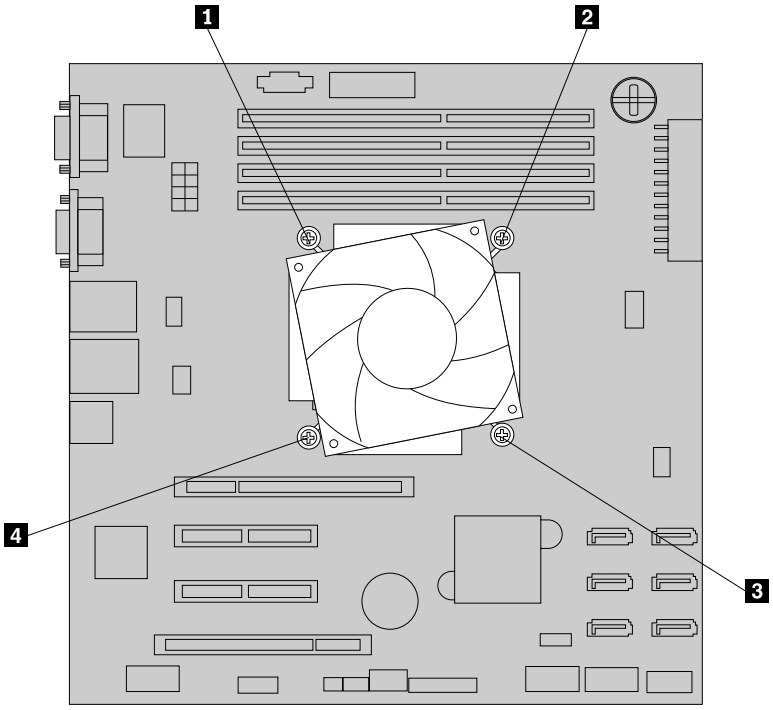


Figure 91. Installing the screws to secure the heat sink and fan assembly

11. Connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board. See "System board components" on page 42.

    Note: If the heat sink and fan assembly cable is too long, loosely knot the cable for proper cable routing.

12. If you are instructed to return the old heat sink and fan assembly, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 162.

Replacing the microprocessor

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 83.

This topic provides instructions on how to replace the microprocessor.

CAUTION:

The heat sink and fan assembly and the microprocessor might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To replace the microprocessor, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Remove the heat sink and fan assembly. See “Replacing the heat sink and fan assembly” on page 154.
5. Gently press down the small handle on the microprocessor socket and then pull the handle a little bit outward to release it from the secured position. Then, pivot the handle upward until the handle and the microprocessor retainer are in the fully open position.

   Note: Your microprocessor and socket might look different from the one illustrated.

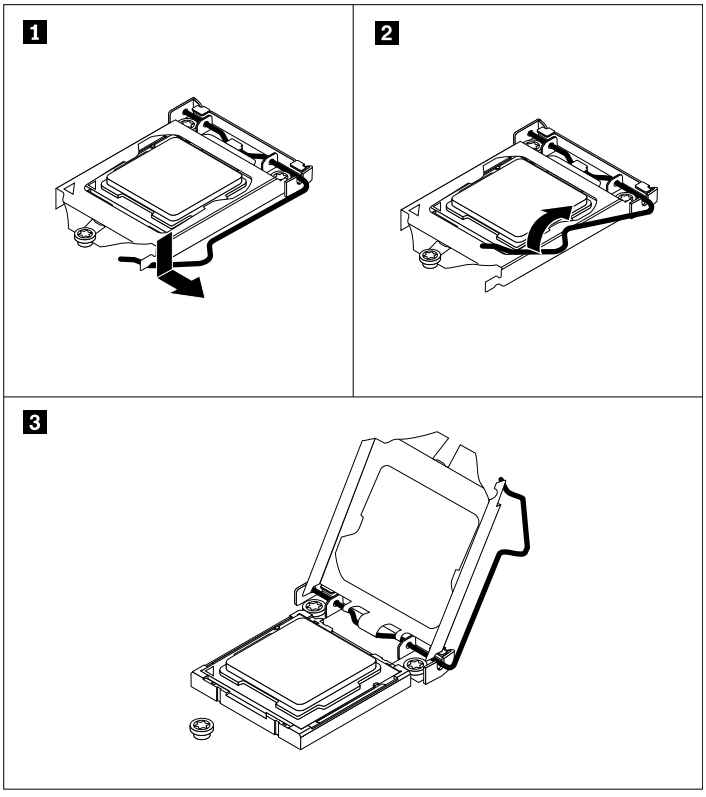


Figure 92. Lifting the handle to open the microprocessor retainer

6. Touch only the edges of the microprocessor and carefully lift it straight up and out of the microprocessor socket. Place the old microprocessor on a static-protective surface.

   Note: Do not touch the gold contacts on the bottom of the microprocessor.

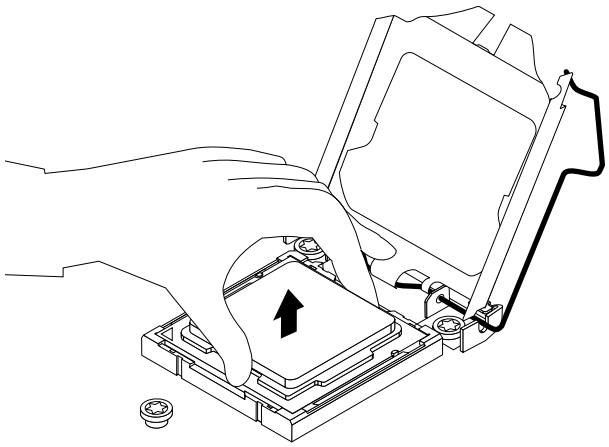


Figure 93. Removing the microprocessor

7. Make sure that the small handle and the microprocessor retainer are in the fully open position.

   Note: Do not drop anything onto the microprocessor socket while it is exposed. The socket pins must be kept as clean as possible.
8. Touch the static-protective package that contains the new microprocessor to any unpainted surface on the outside of the server. Then, remove the new microprocessor from the package.
9. Remove the new microprocessor from the protective cover that protects the gold contacts on the bottom of the new microprocessor.

   Note: Do not touch the pins on the microprocessor socket and the gold contacts on the bottom of the new microprocessor.

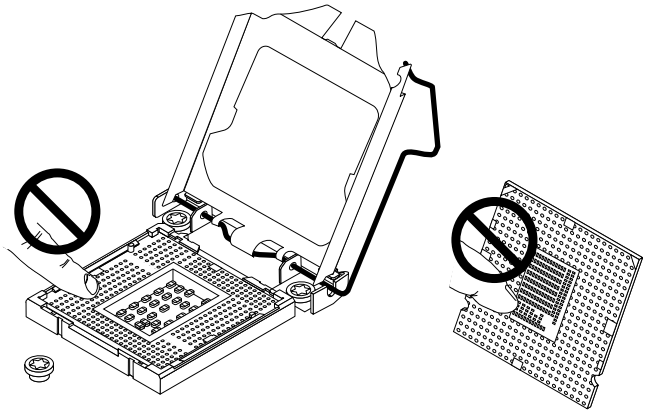


Figure 94. Do not touch the pins

10. Hold the new microprocessor by its edges and align the notches 1 on the new microprocessor with the tabs 2 in the microprocessor socket. Then, carefully lower the new microprocessor straight down into the microprocessor socket.

    Note: The small triangle 3 on one corner of the new microprocessor is the microprocessor orientation indicator. The new microprocessor is in the correct orientation when this indicator faces toward the beveled corner 4 of the microprocessor socket.

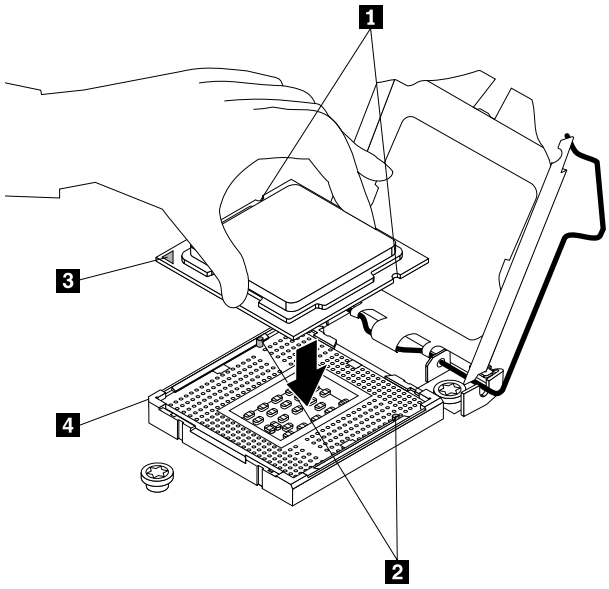


Figure 95. Installing the microprocessor

11. Close the microprocessor retainer. Gently press down the small handle and then push the handle inward to lock the retainer into position and secure the new microprocessor in the socket.

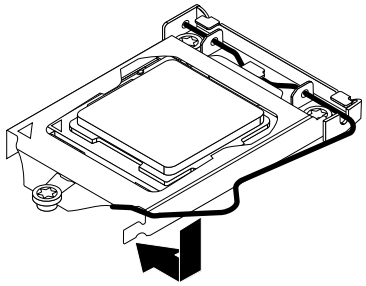


Figure 96. Securing the microprocessor in the socket

12. Reinstall the heat sink and fan assembly. See “Replacing the heat sink and fan assembly” on page 154.
13. If you are instructed to return the old microprocessor, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 162.

Replacing the system board battery

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to replace the system board battery.

Your server has a special type of memory that maintains the date, time, and configuration information for built-in features. The system board battery keeps the information active when you turn off the server. The system board battery normally requires no charging or maintenance throughout its life; however, no battery lasts forever. If the system board battery fails, the date, time, and configuration information, including passwords, are lost and an error message is displayed when you turn on the server.

DANGER

Danger of explosion if battery is incorrectly replaced.

When replacing the lithium coin cell battery, use only the same or an equivalent type that is recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

The following statement applies to users in the state of California, U.S.A.

California Perchlorate Information:

Products containing CR (manganese dioxide) lithium coin cell batteries may contain perchlorate.

Perchlorate Material - special handling may apply, See http://www.dtsc.ca.gov/hazardouswaste/perchlorate

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To replace the system board battery, do the following:

Note: After you replace the system board battery, you must reset passwords, reset system date and time, and reconfigure the server.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 85.
3. Lay the server on its side for easier operation.
4. Locate the system board battery. See “Server components” on page 25.
5. Remove any installed PCI card that impedes your access to the system board battery. See “Removing a PCI card” on page 95.

6. Remove the old system board battery.

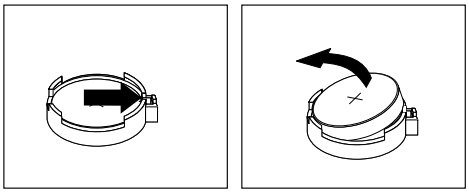


Figure 97. Removing the system board battery

7. Install a new system board battery.

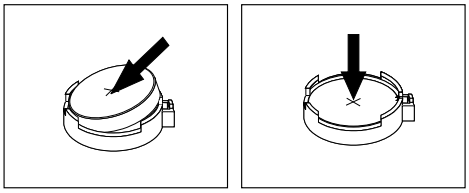


Figure 98. Installing the system board battery

8. Reinstall the PCI card that has been removed. See “Installing a PCI card” on page 93.
9. Dispose of the old system board battery as required by local ordinances or regulations.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 162. After you replace the system board battery, you must reset passwords, reset system date and time, and reconfigure the server. See Chapter 5 “Configuring the server” on page 55.

Completing the parts replacement

This topic provides instructions to help you complete the parts replacement and turn on your server.

To complete the parts replacement, you must properly route the cables inside the server, reinstall the server cover, reconnect all the external cables and, for some devices, update the firmware and run the Setup Utility program to do further setup.

Reinstalling the server cover and reconnecting cables

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 83.

This topic provides instructions on how to reinstall the server cover and reconnect cables to your server.

Attention: For proper cooling and airflow, reinstall the server cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To reinstall the server cover and reconnect cables to your server, do the following:

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside your server.
2. Make sure that all internal cables are routed correctly and secured by any cable clips or ties in the server. Keep cables clear of the hinges and sides of the server chassis to avoid interference with reinstalling the server cover.
3. If you have removed the front bezel, reinstall it. See “Removing and reinstalling the front bezel” on page 87.
4. Position the server cover on the chassis so that the rail on the bottom of the server cover engages the bottom rail on the chassis. Then, align the four tabs **1** on the server cover with the corresponding holes in the top edge of the chassis. Pivot the server cover to close it.

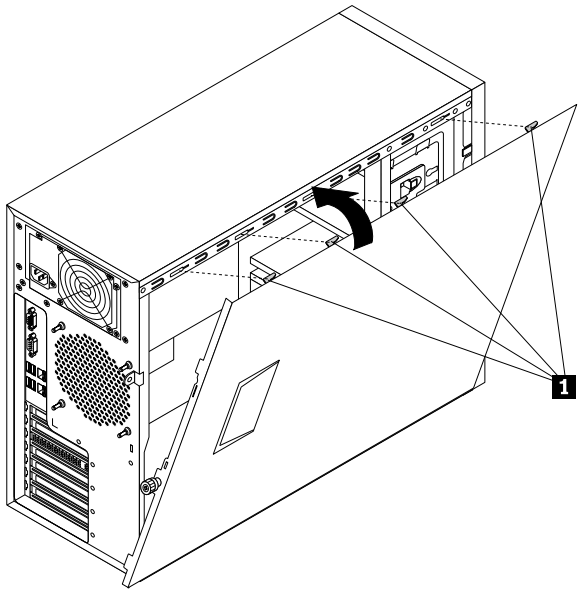


Figure 99. Closing the server cover

5. Slide the server cover to the front of the chassis until it snaps into position.

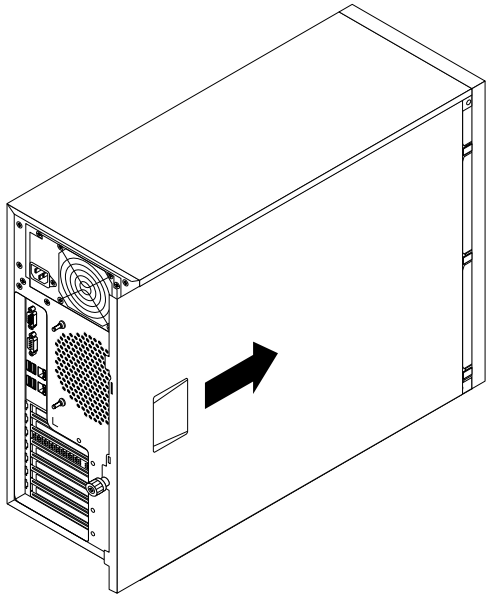


Figure 100. Installing the server cover

6. Tighten the thumbscrew on the server cover to secure the server cover in place.

   Note: For safety consideration, be sure to use a tool, for example a screwdriver, to tighten the thumbscrew and always make sure that the thumbscrew is securely installed. Also, do not over-tighten the thumbscrew.
7. Lock the server cover and server front door to ensure the security. See “Server locks” on page 22.
8. Reconnect external cables and power cord(s) to the server. See “Rear view of the server” on page 19 to identify the connectors on the rear panel of the server.

   Attention: To avoid component damage, connect the power cord(s) last.

Note: In most areas of the world, Lenovo requires the return of the defective CRU. Information about this will come with the CRU or will come a few days after the CRU arrives.

Updating the server configuration

When you turn on the server for the first time after you install, remove, or replace a device, you might need to update the server configuration.

Some optional devices have device drivers that you must install. For information about installing device drivers, use the documentation that comes with each optional device. To obtain the supported device drivers for your server from the Lenovo Support Web site, go to http://www.lenovo.com/support. Click **Download & Drivers → ThinkServer** and follow the instructions on the Web page to find the device drivers you want to download.

Refer to the following information resources to update the server configuration:

- To update the BIOS configuration, see “Using the Setup Utility program” on page 55.
- To update the RAID configuration, see “Configuring RAID” on page 71.

- To use the ThinkServer EasyStartup program, see “Using the ThinkServer EasyStartup program” on page 69.
- To update your system firmware, see “Updating the firmware” on page 81.

Chapter 7. Troubleshooting and diagnostics

This chapter provides information about basic troubleshooting and diagnostic methods to help you solve problems that might occur in the server.

If you cannot diagnose and correct a problem by using the information in this chapter, see Chapter 8 “Getting information, help, and service” on page 175 for additional troubleshooting resources.

Troubleshooting procedure

Use the following information as a general procedure for diagnosing and troubleshooting problems you experience with your server:

1. Verify that the power cords and the cables for all attached devices are connected correctly and securely.
2. Verify that the server and all attached devices that require ac power are connected to properly grounded, functioning electrical outlets.
3. Verify that all installed hardware and attached devices are enabled in the BIOS settings of your server. For more information about accessing and changing the BIOS settings, see “Using the Setup Utility program” on page 55.
4. View the status and diagnostic LEDs to identify the system and device status and diagnose problems. See “Viewing the status and diagnostic LEDs” on page 167.
5. If the server is not working after you have added new software, installed a new optional device, or replaced a piece of hardware, remove or reinstall the software or device to see if the problem could be solved.
6. View the SEL to diagnose problems. See “Viewing the system event log” on page 168.
7. Turn on the server and press Esc as soon as you see the logo screen to view any diagnostic messages.
8. Download and use the PC-Doctor for DOS diagnostic program to diagnose problems. See “Using the diagnostic program” on page 168.
9. Refer to “Basic troubleshooting tables” on page 168 and follow the instructions for the type of problem you are experiencing. If the basic troubleshooting information does not help you resolve a problem, continue with the next step.
10. Try using a previously server configuration to see if a recent change to hardware or software settings has caused a problem. Before restoring your previous configuration, capture your current configuration in case the older configuration settings do not solve the problem or have adverse effect.
11. Use an antivirus program to see if your server has been infected by a virus. If the program detects a virus, remove the virus.
12. If none of these actions solve the problem, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 175.

Viewing the status and diagnostic LEDs

Your server has status and diagnostic LEDs on the front panel, the DIT panel (varies by model), the rear panel (Ethernet status LEDs), the system board, the hot-swap hard disk drives (if supported), and the optical drive(s). The various LEDs help you easily identify the system and device status and diagnose problems. For information about the LEDs, refer to the related topics in “Locations” on page 13.

Using the diagnostic program

The PC-Doctor for DOS diagnostic program runs independently of the operating system. Use this diagnostic program to test and gather information about your system in order to ensure your system is working correctly and resolve any hardware issues. You can run the diagnostic program from a diagnostic disc that you created.

To use the diagnostic program, do the following:

Note: Lenovo maintains the Support Web site by making changes and improvements periodically. The actual procedure might vary slightly from what is described in this topic.

1. Go to the Lenovo Support Web site at:
   http://www.lenovo.com/support
2. Click **Download & Drivers → ThinkServer**.
3. Find the product name and click the machine type of your server. To find the machine type information on the chassis, see “Machine type, model, and serial number label” on page 13.
4. Click **PC Doctor** to quickly locate the diagnostic program on the Web page.
5. Click the version number of the PC-Doctor for DOS diagnostic program and then follow the instructions on the Web page to download the ISO image and the readme file in TXT.
6. Use any disc burning software to create a bootable disc with the ISO image.
7. Print the readme file that contains the instructions on how to use the diagnostic program and follow the instructions to start the program from the disc. Then, follow the instructions on the screen to start the diagnostic test.
8. Remove the diagnostic disc from the optical drive when you complete the diagnostic process.

Viewing the system event log

The system event log (SEL) contains information about all the POST and system management interrupt (SMI) events. You can view the SEL to diagnose system problems.

The BMC implements the SEL as specified in the IPMI 2.0 specification. The SEL is accessible regardless of the system power state through the BMC in-band and out-of-band interfaces.

For more information about viewing the SEL, refer to the *Remote Management Module User Guide* on the documentation DVD that comes with your server.

Basic troubleshooting tables

Use the basic troubleshooting information to find solutions to problems that have definite symptoms.

ThinkServer EasyStartup program problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 167 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 175.

Note: If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 83.

Symptom	Action
The *ThinkServer EasyStartup* DVD does not start.	1. Make sure that the server supports the ThinkServer EasyStartup program and has a bootable DVD drive. 2. Make sure that you have set the optical drive with the *ThinkServer EasyStartup* DVD as the first startup device. 3. Verify if the optical drive or the disc has problems. See “Optical drive problems” on page 169.
The operating system installation program continuously loops.	Make more space available on the hard disk drive.
The ThinkServer EasyStartup program cannot start the operating system media.	1. Make sure that the operating system media is supported by the ThinkServer EasyStartup program version your are using. For a list of the supported operating systems, refer to the user guide and compatibility notes for the ThinkServer EasyStartup program through the program main interface. See “Starting the ThinkServer EasyStartup program” on page 70. 2. Verify if the optical drive or the disc has problems. See “Optical drive problems” on page 169.

Optical drive problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 167 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 175.

Notes:

1. If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 83.
2. If an action step is preceded by “(Trained service technician only),” this action step is reserved for a trained service technician and must be performed only by a trained service technician.

Symptom	Action
The optical drive is not recognized.	1. Make sure that: • The signal cable and connector are not damaged and the connector pins are not bent. • The optical drive is securely connected to the correct SATA connector on the system board and the SATA connector is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 55. • All cables and jumpers (if any) are installed correctly. • The correct device driver is installed for the optical drive. 2. Run any optical drive diagnostic programs if you have. 3. Reinstall the optical drive and reconnect cables. 4. Replace the signal cable for the optical drive.

Symptom	Action
	5. Replace the optical drive. 6. (Trained service technician only) Replace the system board.
A disc is not working correctly.	1. Make sure that the disc is in the optical drive with the shiny side facing down. 2. Make sure that the disc surface is clean and not scratched. 3. Check the disc or package for regional coding. You might need to purchase a disc with coding for the region where you are using the product. 4. Restart the disc player program. 5. Restart the server. 6. Run any optical drive diagnostic programs if you have. 7. Reinstall the optical drive and reconnect cables. 8. Replace the signal cable for the optical drive. 9. Replace the optical drive.

Hard disk drive problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 167 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 175.

Notes:

1. If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 83.
2. If the server model comes with hot-swap hard disk drives, the status LEDs on each hot-swap hard disk drive help you easily identify a problem. See “Hot-swap hard disk drive status LEDs” on page 32.

Symptom	Action
A newly installed non-hot-swap hard disk drive is not recognized.	1. Make sure that: • The signal cable and connector are not damaged. • The non-hot-swap hard disk drive is securely connected to the correct SATA connector on the system board and the SATA connector is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 55. • All cables and jumpers (if any) are installed correctly. 2. Run any diagnostic programs to test the hard disk drive. 3. Reinstall the non-hot-swap hard disk drive and reconnect cables. 4. Replace the signal cable for the non-hot-swap hard disk drive.

Symptom	Action
	5. Replace the non-hot-swap hard disk drive.
A newly installed hot-swap hard disk drive is not recognized.	1. Make sure that the drive is installed into the correct drive bay. 2. Restart the server. 3. Remove the drive from the bay, wait 45 seconds, and reinsert the drive into the bay, making sure that the drive connects to the hot-swap hard disk drive backplane. 4. Run any diagnostic programs to test the hard disk drive. 5. Make sure that the hot-swap hard disk drive backplane is correctly seated. When it is correctly seated, the drive assemblies correctly connect to the backplane without bowing or causing movement of the backplane. 6. Make sure that the cable connection is correct. See “Connecting cables” on page 38. 7. Reconnect the backplane power cable and repeat step 1 through step 4. 8. Reconnect the backplane signal cable and repeat step 1 through step 4. 9. If you suspect a problem with the backplane signal cable or the backplane: a. Replace the affected backplane signal cable. b. Replace the affected backplane.
Multiple hard disk drives fail.	1. Run any diagnostic programs to test the hard disk drives. 2. Make sure that the cable connection is correct. See “Connecting cables” on page 38. 3. Reconnect the power cable. 4. Reconnect the signal cable. 5. Replace the affected signal cable. 6. For hot-swap hard disk drives, if you suspect a problem with the backplane, replace the affected backplane.
Not all drives are recognized by the hard disk drive diagnostic test.	Remove the drive(s) that are not recognized by the diagnostic test. Then, run the hard disk drive diagnostic test again. If the remaining drives are recognized, replace the drive(s) that you removed.
The server stops responding during the hard disk drive diagnostic test.	Remove the hard disk drive that was being tested when the server stopped responding and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	Reinstall all hard disk drives and reconnect cables. Then, run the hard disk drive diagnostic test.

Memory module problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 167 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 175.

Notes:

1. If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 83.
2. If an action step is preceded by “(Trained service technician only),” this action step is reserved for a trained service technician and must be performed only by a trained service technician.

Symptom	Action
The amount of system memory that is displayed is less than the total capacity of the installed physical memory modules and you suspect a memory module problem.	1. Make sure that: • All memory modules are the correct type supported by the server. See “Features” on page 7. • You follow the memory module installation rules. See “Memory module installation rules” on page 90. • All memory modules are seated correctly and securely. • The system firmware is up-to-date. 2. Run any diagnostic programs to test the memory modules. 3. Reinstall the memory modules. 4. Replace the suspect memory modules. 5. (Trained service technician only) Replace the system board.

Keyboard, mouse, or USB device problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 167 for the subsequent steps you should check after using the information in this topic.

Symptom	Action
All or some keys on the keyboard do not work.	1. Make sure that: • The USB keyboard cable is securely connected to a USB connector on the server. If the USB keyboard is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server. • No keys are stuck. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 55. 2. Restart the server.

Symptom	Action
	3. Replace the keyboard.
The mouse or pointing device does not work.	1. Make sure that: • The mouse or pointing device cable is securely connected to the server. If the USB mouse or pointing device is connected to a USB hub, disconnect the mouse or pointing device from the hub and connect it directly to the server. • The mouse or pointing device is clean and no dust accumulates. • The device drivers are installed correctly. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 55. 2. Restart the server. 3. Replace the mouse or pointing device.
A USB device does not work.	1. Make sure that: • The USB cable is securely connected to the server. If the USB device is connected to a USB hub, disconnect the device from the hub and connect it directly to the server. • The device drivers are installed correctly. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 55. 2. Restart the server. 3. Replace the USB device.

Chapter 8. Getting information, help, and service

This chapter contains information about help, service, and technical assistance for products manufactured by Lenovo and where to go for additional information about Lenovo and Lenovo products.

Information resources

You can use the information in this topic to access useful resources relating to your needs when using the product.

Using the documentation

Information about your Lenovo system and installed software, if any, or optional device is available in the documentation that comes with the product. The documentation can include printed documents, online documents, readme files, and help files. Most of the documentation for your server is on the documentation DVD provided with your server. Refer to the troubleshooting information in your server *User Guide* for instructions on how to use the diagnostic programs and how to do basic troubleshooting. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. Lenovo maintains pages on the World Wide Web where you can get the latest technical information and download documentation or device drivers and updates. To access the Lenovo Support Web site, go to:
http://www.lenovo.com/support

For more information about your server documentation, see “Server documentation” on page 2.

If you suspect a software problem, refer to the documentation, including readme files and online help, that comes with the operating system or software program.

ThinkServer Web site (http://www.lenovo.com/thinkserver)

The ThinkServer Web site provides up-to-date information and services to help you buy, use, upgrade, and maintain your server. You can also do the following:

- Shop for servers as well as upgrades and accessories for your server.
- Purchase additional services and software.
- Purchase upgrades and extended hardware repair services.
- Access the Lenovo Limited Warranty (LLW).
- Access the online manuals for your products.
- Access troubleshooting and support information for your server model and other supported products.
- Download the latest device drivers and software updates for your server model.
- Find the service and support phone numbers for your country or region.
- Find a Service Provider located near you.

Lenovo Support Web site

Technical support information is available on the Lenovo Support Web site at:
http://www.lenovo.com/support

This portal is updated with the latest information about the following subjects:

Download & Drivers	Download drivers, flash the BIOS, and update your software.
Warranty	Check your warranty status and upgrade your warranty.
Technical Support	Click **Need Help?** for self-help tips to help diagnose problems.
ThinkVantage	Learn more about ThinkVantage® software to improve productivity and reduce cost for personal computers.
Lenovo Forums	Search the community knowledge base for your computer to share and discover information with other users.
User Guides & Manuals	Read or download the documentation related to your product.

Help and service

This topic contains information about obtaining help and service.

Before you call

Before you call, do the following to try to solve the problem by yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and optional devices are turned on.
- Use the troubleshooting information in your system documentation on the documentation DVD that comes with your product.
- Check for the updated information, new device drivers, and hints and tips on the Lenovo Support Web site at:
  http://www.lenovo.com/support

If possible, be at your product when you call. Have the following information available:

- Machine type and model
- Serial numbers of your Lenovo hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center.

The following services are available during the warranty period:

- **Problem determination** - Trained service personnel are available to assist you with determining a hardware problem and deciding what action is necessary to fix the problem.
- **Hardware repair** - If the problem is caused by hardware under warranty, trained service personnel are available to provide the applicable level of service.

- **Engineering Change management** - There might be changes that are required after a product has been sold. Lenovo or your reseller will make selected Engineering Changes (ECs) that apply to your hardware available.

The warranty does not cover the following:
- Replacement or use of parts not manufactured for or by Lenovo or non-warranted Lenovo parts
- Identification of software problem sources
- Configuration of the Unified Extensible Firmware Interface (UEFI) as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

For the warranty type and duration for your product, refer to the *Warranty and Support Information* on the documentation DVD that comes with you server. You must retain your proof of purchase to obtain warranty service.

For warranty service, consult the worldwide Lenovo Support telephone list. Telephone numbers are subject to change without notice. The most up-to-date telephone list for Lenovo Support is always available on the Web site at http://www.lenovo.com/support/phone. If the telephone number for your country or region is not listed, contact your Lenovo reseller or Lenovo marketing representative.

Using other services

If you travel with a Lenovo notebook computer or relocate your computer to a country where your desktop, notebook, or server machine type is sold, your computer might be eligible for International Warranty Service, which automatically entitles you to obtain warranty service throughout the warranty period. Service will be performed by service providers authorized to perform warranty service.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your computer is eligible for International Warranty Service and to view a list of the countries where service is available, go to http://www.lenovo.com/support, click **Warranty**, and follow the instructions on the screen.

For technical assistance with the installation of or questions related to Service Packs for your installed Windows product, refer to the Microsoft Product Support Services Web site at http://support.microsoft.com/directory or you can contact the Customer Support Center. Some fees might apply.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for hardware, operating systems, and application programs; network setup and configuration services; upgraded or extended hardware repair services; and custom installation services. Service availability and service name might vary by country or region. For more information about these services, go to the Lenovo Web site at: http://www.lenovo.com

Appendix A. Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service.

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Morrisville, NC 27560
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Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk.

Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Trademarks

Lenovo, the Lenovo logo, ThinkServer, and ThinkVantage are trademarks of Lenovo in the United States, other countries, or both.

Intel, Intel Core, and Intel Xeon are trademarks of Intel Corporation in the United States, other countries, or both.

Microsoft and Windows are trademarks of the Microsoft group of companies.

Other company, product, or service names may be trademarks or service marks of others.

Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Polyvinyl Chloride (PVC) cable and cord notice

WARNING: Handling the cord on this product or cords associated with accessories sold with this product will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling***.

Recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. For information on recycling Lenovo products, go to:
http://www.lenovo.com/lenovo/environment/recycling

環境配慮に関して

本機器またはモニターの回収リサイクルについて

企業のお客様が、本機器が使用済みとなり廃棄される場合は、資源有効利用促進法の規定により、産業廃棄物として、地域を管轄する県知事あるいは、政令市長の許可を持った産業廃棄物処理業者に適正処理を委託する必要があります。また、弊社では資源有効利用促進法に基づき使用済みパソコンの回収および再利用・再資源化を行う「PC 回収リサイクル・サービス」を提供しています。詳細は、
http://www.lenovo.com/recycling/japanをご参照ください。

また、同法により、家庭で使用済みとなったパソコンのメーカー等による回収再資源化が 2003 年 10 月 1 日よりスタートしました。詳細は、
http://www.lenovo.com/recycling/japanをご参照ください。

重金属を含む内部部品の廃棄処理について

本機器のプリント基板等には微量の重金属（鉛など）が使用されています。使用後は適切な処理を行うため、上記「本機器またはモニターの回収リサイクルについて」に従って廃棄してください。

Collecting and recycling a disused Lenovo computer or monitor

If you are a company employee and need to dispose of a Lenovo computer or monitor that is the property of the company, you must do so in accordance with the Law for Promotion of Effective Utilization of Resources. Computers and monitors are categorized as industrial waste and should be properly disposed of by an industrial waste disposal contractor certified by a local government. In accordance with the Law for Promotion of Effective Utilization of Resources, Lenovo Japan provides, through its PC Collecting and Recycling Services, for the collecting, reuse, and recycling of disused computers and monitors. For details, visit the Lenovo Web site at http://www.lenovo.com/social_responsibility/us/en/sustainability/ptb_japan.html. Pursuant to the Law for Promotion of Effective Utilization of Resources, the collecting and recycling of home-used computers and monitors by the manufacturer was begun on October 1, 2003. This service is provided free of charge for home-used computers sold after October 1, 2003. For details, visit the Lenovo Web site at http://www.lenovo.com/social_responsibility/us/en/sustainability/ptb_japan.html.

Disposing of Lenovo computer components

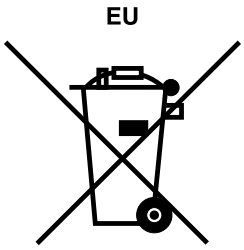
Some Lenovo computer products sold in Japan may have components that contain heavy metals or other environmental sensitive substances. To properly dispose of disused components, such as a printed circuit board or drive, use the methods described above for collecting and recycling a disused computer or monitor.

Battery return program

This product may contain a lithium or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal or batteries outside the United States, go to http://www.lenovo.com/lenovo/environment/recycling or contact your local waste disposal facility.

For Taiwan: Please recycle batteries.

For the European Union:



Notice: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, go to:
http://www.lenovo.com/lenovo/environment

Requirement for batteries containing perchlorate

The following statement applies to users in the state of California, U.S.A.

California Perchlorate Information:

Products containing CR (manganese dioxide) lithium coin cell batteries may contain perchlorate.

Perchlorate Material - special handling may apply, See http://www.dtsc.ca.gov/hazardouswaste/perchlorate

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the server to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates

or gases in your environment have caused damage to the server, Lenovo may condition provision of repair or replacement of servers or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 1. Limits for particulates and gases

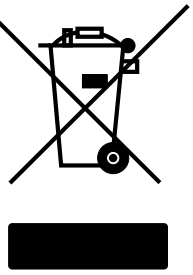
Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Important information for the European Directive 2002/96/EC



EU Only

The Waste Electrical and Electronic Equipment (WEEE) mark applies only to countries within the European Union (EU) and Norway. Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive. Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information go to:
http://www.lenovo.com/lenovo/environment

Le marquage des déchets d'équipements électriques et électroniques (DEEE) s'applique uniquement aux pays de l'Union européenne (EU) et à la Norvège. Les appareils sont marqués conformément à la Directive 2002/96/CE du Conseil Européen relative aux déchets d'équipements électriques et électroniques (DEEE). Cette directive, applicable à l'ensemble des pays de l'Union européenne, concerne la collecte et le recyclage des appareils usagés. Ce marquage est apposé sur différents produits pour indiquer que ces derniers ne doivent pas être jetés, mais récupérés en fin de vie, conformément à cette directive. Les utilisateurs

d'équipements électriques et électroniques portant le marquage DEEE, conformément à l'Annexe IV de la Directive DEEE, ne doivent pas mettre au rebut ces équipements comme des déchets municipaux non triés, mais ils doivent utiliser la structure de collecte mise à disposition des clients pour le retour, le recyclage et la récupération des déchets d'équipements électriques et électroniques, afin de réduire tout effet potentiel des équipements électriques et électroniques sur l'environnement et la santé en raison de la présence possible de substances dangereuses dans ces équipements. Pour plus d'informations sur les équipements électriques et électroniques, consultez le site http://www.lenovo.com/lenovo/environment.

Die WEEE-Kennzeichnung gilt nur in Ländern der Europäischen Union und in Norwegen. Geräte werden gemäß der Richtlinie 2002/96/EC der Europäischen Union über Elektro- und Elektronikaltgeräte (WEEE) gekennzeichnet. Die Richtlinie regelt die Rückgabe und Wiederverwertung von Altgeräten innerhalb der Europäischen Union. Mit dieser Kennzeichnung versehene Altgeräte dürfen gemäß dieser Richtlinie nicht weggeworfen werden, sondern müssen zurückgegeben werden. Anwender von Elektro- und Elektronikgeräten mit der WEEE-Kennzeichnung dürfen diese gemäß Annex IV der WEEE-Richtlinie nach ihrem Gebrauch nicht als allgemeinen Hausmüll entsorgen. Stattdessen müssen diese Geräte im verfügbaren Sammelsystem zurückgegeben werden und damit einem Recycling- oder Wiederherstellungsprozess zugeführt werden, bei dem mögliche Auswirkungen der Geräte auf die Umwelt und den menschlichen Organismus aufgrund gefährlicher Substanzen minimiert werden. Weitere Informationen zur Entsorgung von Elektro- und Elektronikaltgeräten finden Sie unter der Adresse: http://www.lenovo.com/lenovo/environment.

La marca de Residuos de equipos eléctricos y electrónicos (WEEE) se aplica sólo a los países pertenecientes a la Unión Europea (UE) y a Noruega. Los aparatos se etiquetan conforme a la Directiva Europea 2002/96/EC relativa a los residuos de equipos eléctricos y electrónicos (WEEE). La directiva determina el marco para devolver y reciclar los aparatos usados según sea aplicable en toda la Unión Europea. Esta etiqueta se aplica a varios productos para indicar que el producto no se va a desechar, sino que va ser reclamado por esta Directiva, una vez termine su ciclo de vida. Los usuarios de los equipos eléctricos y electrónicos (EEE) con la marca WEEE por el Anexo IV de la Directiva WEEE no deben tratar los EEE como desperdicios municipales no clasificados, una vez terminado su ciclo de vida, sino que deben utilizar el marco de recogida disponible para devolver, reciclar y recuperar los WEEE y minimizar los posibles efectos de los EEE en el medio ambiente y en la salud debidos a la presencia de substancias peligrosas. Para obtener información adicional acerca de WEEE consulte el sitio: http://www.lenovo.com/lenovo/environment.

Il marchio WEEE (Waste Electrical and Electronic Equipment) viene applicato soltanto ai paesi all'interno dell'unione europea (EU) e norvegia. Le apparecchiature vengono etichettate in accordo con la direttiva europea 2002/96/EC riguardande lo smaltimento di apparecchiatura elettrica ed alettronica (WEEE). Le direttive determinano la procedura di restituzione e di riciclaggio delle apparecchiature usate in conformità con le normative dell'unione europea. Questa classificazione viene applicata a vari prodotti per indicare che il prodotto stesso non deve essere gettato ma riscattato al termine dell'utilizzo per quasta direttiva. Gli utenti di apparecchiature elettriche o elettroniche (EEE) marchiate WEEE secondo Annex IV della direttiva WEEE non devono disporre di fine utilizzo EEE come rifiuto, municipale non classificato, ma deve essere utilizzata la procedura di classificazione disponibile per il riscatto, riciclo, recupero del WEEE e minimizzare qualsiasi potenziale effetto della EEE sull'ambiente e sulla salute umana dovuto alla presenza di sostanze pericolose. Per ulteriori informazioni sulla WEEE visitare il sito: http://www.lenovo.com/lenovo/environment.

A marca REEE (Resíduos de Equipamentos Eléctricos e Electrónicos) aplica-se apenas aos Estados Membros da União Europeia e à Noruega. Os aparelhos eléctricos deverão ser identificados em conformidade com a Directiva Europeia 2002/96/CE relativa a REEE (Resíduos de Equipamentos Eléctricos e Electrónicos). A Directiva determina o enquadramento normativo relativamente à devolução e reciclagem de aparelhos eléctricos utilizados, conforme aplicável no espaço da União Europeia. Esta etiqueta deverá ser aposta em diversos produtos para indicar que os mesmos não poderão ser deitados fora, mas sim recuperados no final da respectiva vida útil, de acordo com a referida Directiva. Os utilizadores de equipamentos eléctricos e electrónicos (EEE) com a marca REEE em conformidade com o Anexo IV da Directiva REEE não poderão deitar fora os EEE no final da respectiva vida útil como lixo municipal não separado, devendo sim utilizar a estrutura de recolha que lhes tenha sido disponibilizada para efeitos de devolução, reciclagem e recuperação de REEE, por forma a minimizar potenciais efeitos dos EEE sobre

o ambiente e saúde pública resultantes da presença de substâncias perigosas. Para obter informações adicionais acerca da REEE consulte o sítio da web: http://www.lenovo.com/lenovo/environment.

Het WEEE-merkteken (Waste Electrical and Electronic Equipment) geldt alleen voor landen binnen de Europese Unie (EU) en Noorwegen. Apparaten worden van een merkteken voorzien overeenkomstig Europese Richtlijn 2002/96/EC inzake afgedankte elektrische en elektronische apparatuur (waste electrical and electronic equipment, WEEE). Deze richtlijn bepaalt het raamwerk voor het retourneren en recyclen van gebruikte apparatuur, zoals van toepassing binnen de Europese Unie. Dit merkteken wordt aangebracht op diverse producten om aan te geven dat het product in kwestie niet dient te worden weggegooid, maar dat het aan het eind van de levenscyclus krachtens deze Richtlijn dient te worden geretourneerd. Gebruikers van elektrische en elektronische apparaten (EEE) welke zijn voorzien van het WEEE-merkteken zijn gehouden aan Annex IV van de WEEE Richtlijn en mogen gebruikte EEE niet weggooien als ongesorteerd afval, maar dienen gebruik te maken van het inzamelproces voor het teruggeven, recyclen en terugwinnen van WEEE dat voor hen beschikbaar is, en dienen de mogelijke effecten die EEE ten gevolge van de aanwezigheid van schadelijke stoffen kunnen hebben op het milieu en de volksgezondheid, tot een minimum te beperken. Voor meer informatie over WEEE gaat u naar: http://www.lenovo.com/lenovo/environment.

WEEE-mærkningen (Waste Electrical and Electronic Equipment) gælder kun for lande i EU samt Norge. Udstyr mærkes i henhold til EU's direktiv 2002/96/EF om affald af elektrisk og elektronisk udstyr (WEEE). Direktivet fastlægger de rammer, der gælder for returnering og genbrug af brugt udstyr i EU. Mærkaten påsættes forskellige produkter for at angive, at produktet ikke må smides væk, når det er udtjent, men skal genvindes i henhold til dette direktiv. Brugere af elektrisk og elektronisk udstyr (EEE), der er mærket med WEEE-mærket som angivet i Bilag IV til WEEE-direktivet, må ikke bortskaffe brugt EEE som usorteret husholdningsaffald, men skal bruge den indsamlingsordning, der er etableret, så WEEE kan returneres, genbruges eller genvindes. Formålet er at minimere den eventuelle påvirkning af miljøet og menneskers sundhed som følge af tilstedeværelsen af skadelige stoffer. Der er flere oplysninger om affald af elektrisk og elektronisk udstyr på adressen http://www.lenovo.com/lenovo/environment.

Sähkö- ja elektroniikkalaiteromu (Waste electrical and electronic equipment, WEEE) -merkintä koskee vain Euroopan unionin (EU) jäsenmaita ja Norjaa. Sähkö- ja elektroniikkalaitteet merkitään Euroopan parlamentin ja neuvoston direktiivin 2002/96/EY mukaisesti. Kyseinen direktiivi määrittää Euroopan Unionin alueella käytössä olevat palautus- ja kierrätyskäytännöt. WEEE-merkintä laitteessa osoittaa, että direktiivin ohjeiden mukaan tuotetta ei tulisi hävittää sen elinkaaren päässä, vaan se tulee toimittaa uusiokäyttöön. Käyttäjien, joiden sähkö- ja elektroniikkalaitteissa on tämä sähkö- ja elektroniikkalaiteromun direktiivin liitteen IV mukainen merkintä, tulee kierrättää kyseiset laitteet käytettävissä olevien resurssien mukaan ja varmistaa, että niistä tai niissä käytetyistä materiaaleista ei aiheudu haittaa ympäristölle tai ihmisten terveydelle. Sähkö- ja elektroniikkalaitteita ei saa hävittää sekajätteen mukana. Lisätietoja sähkö- ja elektroniikkalaiteromun uusiokäytöstä on WWW-sivustossa http://www.lenovo.com/lenovo/environment.

WEEE-merket (Waste Electrical and Electronic Equipment) gjelder bare for land i Den europeiske union (EU) og Norge. Utstyr merkes i henhold til EU-direktiv 2002/96/EF om avfall fra elektrisk og elektronisk utstyr (WEEE). Direktivet fastsetter rammene for retur og resirkulering av brukt utstyr innenfor EU. Dette merket benyttes på forskjellige produkter for å angi at produktet ikke må kastes, men må behandles i henhold til dette direktivet ved slutten av produktets levetid. Brukere av elektrisk og elektronisk utstyr (EEE) som er merket med WEEE-merket ifølge vedlegg IV i WEEE-direktivet, må ikke kaste utstyret som usortert husholdningsavfall, men må bruke de tilgjengelige innsamlingssystemene for retur, resirkulering og gjenvinning av kassert elektrisk og elektronisk utstyr for å redusere en eventuell skadelig virkning av elektrisk og elektronisk utstyr på miljø og helse, som skyldes skadelige stoffer. Du finner mer informasjon om WEEE på denne adressen: http://www.lenovo.com/lenovo/environment.

Značka odpadní elektrická a elektronická zařízení (OEEZ; Waste Electrical and Electronic Equipment - WEEE) se týká pouze zemí Evropské Unie (EU) a Norska. Zařízení jsou označena v souladu s evropskou směrnicí 2002/96/EC, která se týká likvidace starých elektrických a elektronických zařízení (OEEZ). Směrnice určuje pravidla pro vracení a recyklaci použitých zařízení, která jsou platná v Evropské Unii. Tímto štítkem se označují různá zařízení. Označuje, že produkt nesmí být vyhozen do běžného odpadu, ale po skončení životnosti vrácen podle této směrnice. Uživatelé takovýchto zařízení označených značkou OEEZ podle dodatku IV směrnice OEEZ nesmí na konci životnosti vyhodit zařízení jako netříděný odpad, ale musí použít dostupnou sběrnou síť, aby bylo zařízení recyklováno a aby byly minimalizovány možné dopady zařízení na prostředí a zdraví lidí (zařízení může obsahovat nebezpečné látky). Další informace o značce OEEZ (WEEE) naleznete na webové stránce: http://www.lenovo.com/lenovo/environment.

廃電気電子機器指令 (WEEE) マークは EU 諸国とノルウェーにのみ適用されます。この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC (WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。WEEE 指令の付則 (Annex) IV 規則によりマークされた電気/電子機器 (EEE) の使用者は、使用済みの電気・電子機器を地方自治体の無分別ゴミとして廃棄することは許されず、機器に含まれる有害物質が環境や人体へ与える悪影響を最小に抑えるためにお客様が利用可能な廃電気・電子機器の返却、リサイクル、あるいは再生のための回収方法を利用しなければなりません。WEEE の詳細については、次のWebサイトを参照してください。
Http://www.lenovo.com/lenovo/environment

Το σήμα WEEE (Waste Electrical and Electronic Equipment) χρησιμοποιείται μόνο σε χώρες της Ευρωπαϊκής Ένωσης και στη Νορβηγία. Στις συσκευές τοποθετούνται ετικέτες που αφορούν την απόρριψη ηλεκτρικών και ηλεκτρονικών εξαρτημάτων σύμφωνα με την Ευρωπαϊκή Οδηγία 2002/96/EC. Η Οδηγία αυτή καθορίζει το πλαίσιο για την επιστροφή και την ανακύκλωση χρησιμοποιημένων συσκευών που ισχύει σε όλη την Ευρωπαϊκή Ένωση. Η ετικέτα τοποθετείται σε διάφορα προϊόντα για να υποδείξει ότι μετά το μόνιμο τερματισμό της χρήσης του το προϊόν, σύμφωνα με την Οδηγία, πρέπει να ανακυκλωθεί και όχι να απορριφθεί. Οι χρήστες ηλεκτρικών και ηλεκτρικών εξαρτημάτων (electrical and electronic equipment - EEE) που φέρουν το σήμα WEEE σύμφωνα με το Παράρτημα IV της εν λόγω Οδηγίας, δεν πρέπει να απορρίπτουν τα εξαρτήματα αλλά να χρησιμοποιούν το διαθέσιμο πλαίσιο συλλογής για την επιστροφή, ανακύκλωση και ανάκτηση των εξαρτημάτων με σκοπό την ελαχιστοποίηση δυνητικών επιρροών στο περιβάλλον και την ανθρώπινη υγεία εξαιτίας της παρουσίας επικίνδυνων ουσιών στα εξαρτήματα αυτά. Για περισσότερες πληροφορίες σχετικά με τις κατάλληλες ενέργειες συλλογής και κατεργασίας ηλεκτρονικών συσκευών και εξαρτημάτων, επισκεφθείτε την ιστοσελίδα: http://www.lenovo.com/lenovo/environment.

A WEEE (leselejtezett elektromos és elektronikus berendezések) jelzés csak az EU tagállamaira és Norvégiára vonatkozik. A berendezések a leselejtezett elektromos és elektronikus berendezésekre (WEEE) vonatkozó 2002/96/EC számú EU direktívának való megfelelést tanúsító címkével vannak ellátva. A direktíva a használt berendezések visszavételének és újrahasznosításának keretrendszerét határozza meg az Európai Unión belül. A különböző termékeken látható címke azt jelenti, hogy a terméket az élettartamának végén nem szabad kidobni, hanem a direktívának megfelelően kell visszanyerni. A WEEE jelzésű elektromos és elektronikai felszerelések (EEE) felhasználóinak, a WEEE direktíva IV. függelékének megfelelően nem szabad vegyes házi szemétként kidobniuk az eszközöket (EEE), hanem a vásárlók számára rendelkezésre álló, meglévő begyűjtési keretrendszert felhasználva kell gondoskodniuk az elektromos hulladék (WEEE) visszajuttatásáról és újrahasznosításáról, valamint minimalizálniuk kell az eszközök (EEE) lehetséges hatásait a környezetre és az emberi egészségre, a veszélyek megelőzése érdekében.
További WEEE információk: http://www.lenovo.com/lenovo/environment.

Restriction of Hazardous Substances Directive (RoHS)

This topic provides statements about the Restriction of Hazardous Substances Directive (RoHS).

China RoHS

有毒有害物质或元素名称及含量标识

Toxic / Hazardous Substances and Elements Table

部件名称 (Parts)	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
机架 chassis	O	O	O	O	O	O
外部盖板 external covers	O	O	O	O	O	O
机械组合件 mechanical assemblies	O	O	O	O	O	O
空气传动设备 air moving devices	X	O	O	O	O	O
冷却组合件 cooling assembly	X	O	O	O	O	O
内存模块 memory modules	X	O	O	O	O	O
处理器模块 processor modules	X	O	O	O	O	O
键盘 keyboard	X	O	O	O	O	O
调制解调器 modem	X	O	O	O	O	O
监视器 monitor	X	X	O	O	O	O
鼠标 mouse	X	O	O	O	O	O
电缆组合件 cable assemblies	X	O	O	O	O	O
电源 power supply	X	O	O	O	O	O
存储设备 storage device	X	O	O	O	O	O
电池匣组合件 battery pack assembly	X	O	O	O	O	O
电池 batteries	X	O	O	O	O	O
有 mech 的电路卡 circuit cards with mechs	X	O	O	O	O	O
无 mech 的电路卡 circuit cards w/o mechs	X	O	O	O	O	O
激光器 laser	X	O	O	O	O	O

O：指示部件的所有均质材料中有毒和危险物质的含量均低于 SJ/T 11363-2006 中所描述的浓度限制要求。
O: indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006.

X：指示至少有一种部件均质材料中的有毒和危险物质的含量超过 SJ/T 11363-2006 中所描述的浓度限制要求。
X: indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part exceeds the concentration limit requirement as described in SJ/T 11363-2006.

环保使用期限（EPUP）的免责条款：EPUP 规定的具体期限仅为符合中华人民共和国的相应的法律规定，并非代表 Lenovo 向客户提供保证或负有任何义务。EPUP 中假定客户按照操作手册在正常情况下使用本产品。对于本产品中配备的某些组合件（例如，装有电池的组合件）的 EPUP，其效力可能低于本产品的 EPUP。

Environmental Protection Use Period (EPUP) Disclaimer: The number provided as the EPUP is provided solely to comply with applicable laws of the People's Republic of China. It does not create any warranties or liabilities on behalf of Lenovo to customer. The EPUP assumes that the product will be used under normal conditions in accordance with the Lenovo operating manual. Certain assemblies inside this product (for example, assemblies that contain a battery) may have an EPUP which is lower than the EPUP on this product.

Turkish statement of compliance

The Lenovo product meets the requirements of the Republic of Turkey Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (EEE).

Türkiye EEE Yönetmeliğine Uygunluk Beyanı

Bu Lenovo ürünü, T.C. Çevre ve Orman Bakanlığı'nın “Elektrik ve Elektronik Eşyalarda Bazı Zararlı Maddelerin Kullanımının Sınırlandırılmasına Dair Yönetmelik (EEE)” direktiflerine uygundur.

EEE Yönetmeliğine Uygundur.

German Ordinance for Work gloss statement

The product is not suitable for use with visual display work place devices according to clause 2 of the German Ordinance for Work with Visual Display Units.

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

Electronic emission notices

The following information refers to the Lenovo ThinkServer machine types 0387, 0388, 0389, 0390, 0391, 0392, 0393, and 0441.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Lenovo is not responsible for any radio or television interference caused by using other than specified or recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union - Compliance to the Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

CE

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

German Class A compliance statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit
Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein
Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln“ EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten“). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:
Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.“

Nach dem EMVG: „Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.“ (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Korea Class A compliance statement

A급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다

Japan VCCI Class A compliance statement

この装置は，クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI－A

Japan compliance statement for products which connect to the power mains with rated current less than or equal to 20 A per phase

日本の定格電流が 20A/相 以下の機器に対する高調波電流規制
高調波電流規格 JIS C 61000-3-2 適合品

China Class A compliance statement

声明
此为A级产品。在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A compliance statement

警告使用者
此為甲類資訊技術設備，於居住環境中使用時，可能會造成射頻擾動，在此種情況下，使用者會被要求採取某些適當的對策。

Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下：
荷蘭商聯想股份有限公司台灣分公司
台北市信義區信義路五段七號十九樓之一
服務電話：
0800-000-702 (2011 年 11 月 12 日及之前有效)
0800-666-975 (2011 年 11 月 13 日起生效)

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